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UNIVERSITY of NEW HAMPSHIRE

# University Catalog

1967-68      1968-69

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VOLUME LVIII, NUMBER 8, MAY 1967. The Bulletin of the University of New Hampshire is published twice in November and February and once each in September, December, January, and May. Second-class postage paid at Durham, New Hampshire 03824.

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# Contents

University Calendar	4
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## Officers and Faculty

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Trustees	9	Professional Staff	50
Officers of Administration	10	Administrative Divisions	54
Faculty	11		

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## General Information

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Facts about the University	61	Dining Services	67
Admissions Procedure	63	University Housing	67
Fees and Expenses	66	Financial Aid	68

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## The Colleges

---

University Academic Requirements	73	College of Technology	145
College of Agriculture	74	Whittemore School of Business and Economics	162
College of Liberal Arts	90	Graduate School	173

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## Description of Courses

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IBM Key Codes	177	Summary of Registration	332
Explanation of Arrangement	178	Index	334
Description of Courses	179		

Apr 1st,

# University Calendar 1967-68

## Semester I 1967

add  
classes  
not  
address

September 17, Sunday  
September 18, Monday  
September 19, Tuesday  
September 20, Wednesday  
September 20, Wednesday  
September 29, Friday  
November 13, Monday  
November 13, Monday  
November 21, Tuesday  
November 26, Sunday  
November 27, Monday  
December 2, Saturday  
December 9, Saturday  
December 20, Wednesday

registration  
15-16  
freshman

Residence Halls open  
First Faculty Meeting  
Registration  
8 a.m. Opening Convocation  
10 a.m. Classes follow abbreviated schedule  
4:30 p.m. Last day to add courses  
9 a.m. Midsemester Reports due  
4:30 p.m. Last day to drop courses  
7 p.m. Residence Halls close, Thanksgiving  
2 p.m. Residence Halls open  
8 a.m. Classes resume  
AFROTC Officer Qualification Tests  
AFROTC Officer Qualification Tests  
7 p.m. Residence Halls close, Christmas

## 1968

January 3, Wednesday  
January 4, Thursday  
January 22, Monday  
January 31, Wednesday  
January 31, Wednesday  
February 7, Wednesday

2 p.m. Residence Halls open  
8 a.m. Classes resume  
8 a.m. Semester I Final Examinations begin  
6 p.m. Final Examinations end  
8 p.m. Residence Halls close  
2 p.m. Residence Halls open

## Semester II

February 8, Thursday  
February 9, Friday  
February 10, Saturday  
February 19, Monday  
April 5, Friday  
April 14, Sunday  
April 15, Monday  
April 15, Monday  
April 15, Monday  
May 27, Monday  
May 30, Thursday  
June 4, Tuesday  
June 6, Thursday  
June 6, Thursday  
June 9, Sunday

Registration  
8 a.m. Classes resume  
Classes hold Tuesday schedule  
4:30 p.m. Last day to add courses  
7 p.m. Residence Halls close, Easter  
2 p.m. Residence Halls open  
8 a.m. Classes resume  
9 a.m. Midsemester Reports due  
4:30 p.m. Last day to drop courses  
8 a.m. Semester II Final Examinations begin  
Memorial Day — Holiday  
9 a.m. Senior grades due  
6 p.m. Final Examinations end  
8 p.m. Residence Halls close  
Commencement

# University Calendar 1968-69

## Semester I 1968

*Residence Halls open*

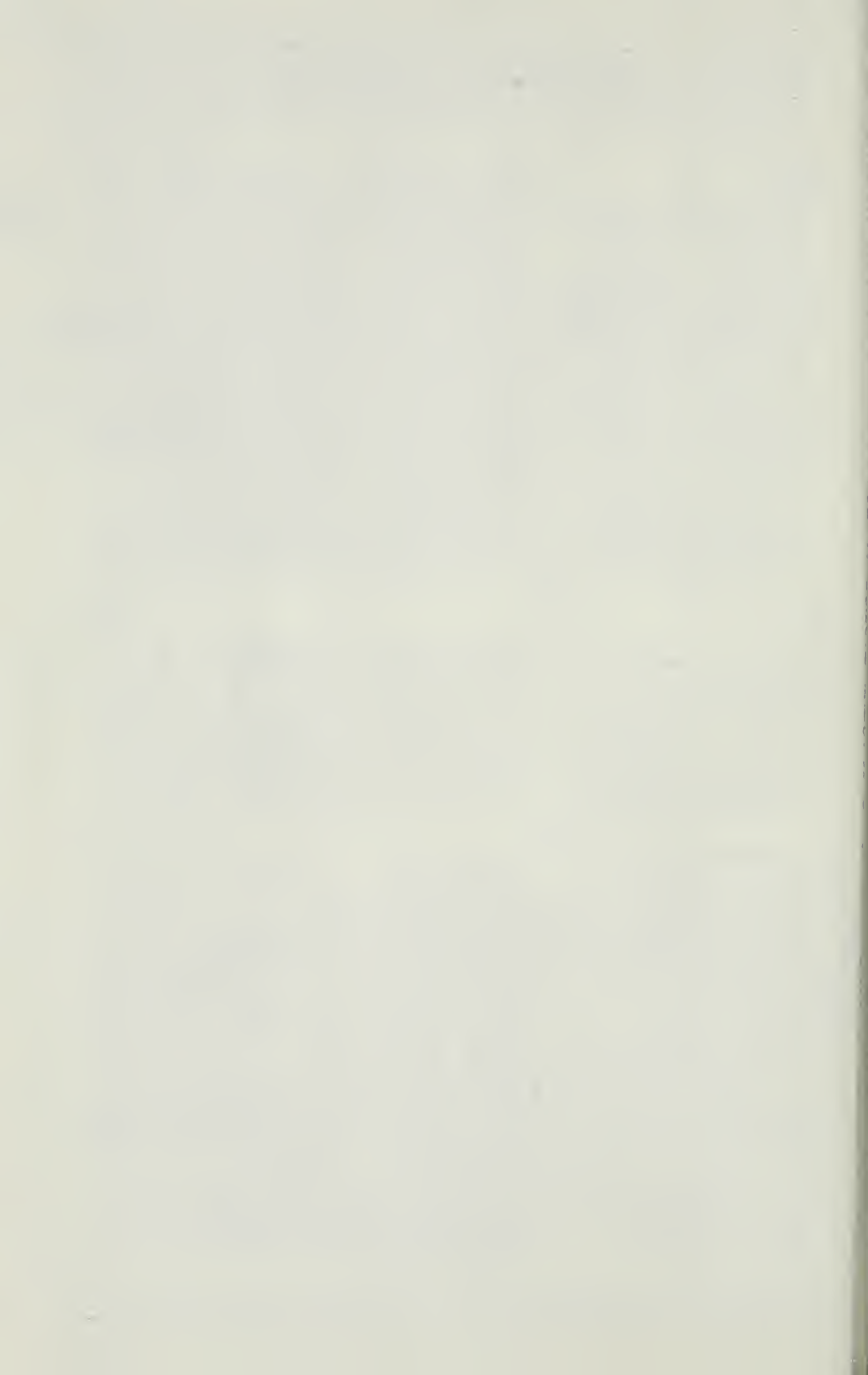
September 15, Sunday	Residence Halls open
September 16, Monday	First Faculty Meeting
September 17, Tuesday	Registration
September 18, Wednesday	8 a.m. Opening Convocation
September 18, Wednesday	10 a.m. Classes follow abbreviated schedule
September 27, Friday	4:30 p.m. Last day to add courses
November 11, Monday	9 a.m. Midsemester reports due
November 11, Monday	4:30 p.m. Last day to drop courses
November 26, Tuesday	7 p.m. Residence Halls close, Thanksgiving
December 1, Sunday	2 p.m. Residence Halls open
December 2, Monday	8 a.m. Classes resume
December 6, Saturday	AFROTC Officer Qualification Tests
December 13, Saturday	AFROTC Officer Qualification Tests
December 20, Friday	7 p.m. Residence Halls close, Christmas

## 1969

January 5, Sunday	2 p.m. Residence Halls open
January 6, Monday	8 a.m. Classes resume
January 20, Monday	8 a.m. Semester I Final Examinations begin
January 29, Wednesday	6 p.m. Final Examinations end
January 29, Wednesday	8 p.m. Residence Halls close <i>Sem I</i>
February 5, Wednesday	2 p.m. Residence Halls open <i>Sem II</i>

## Semester II

February 6, Thursday	Registration
February 7, Friday	8 a.m. Classes resume
February 8, Saturday	<del>Classes hold Tuesday schedule</del>
February 17, Monday	4:30 p.m. Last day to add courses
April 4, Friday	7 p.m. Residence Halls close, Easter
April 13, Sunday	2 p.m. Residence Halls open
April 14, Monday	8 a.m. Classes resume
April 14, Monday	9 a.m. Midsemester reports due
	4:30 p.m. Last day to drop courses
May 26, Monday	8 a.m. Semester II Final Examinations begin
May 30, Friday	Memorial Day — Holiday
June 3, Tuesday	9 a.m. Senior grades due
June 5, Thursday	6 p.m. Final Examinations end
June 5, Thursday	8 p.m. Residence Halls close
June 8, Sunday	Commencement





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**Officers and Faculty**

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# Trustees

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His Excellency, JOHN W. KING, A.B., M.A., LL.B., LL.D., *ex officio*  
Governor of New Hampshire

FRANK T. BUCKLEY, *ex officio*  
Commissioner of Agriculture

PAUL E. FARNUM, B.S., M.S., *ex officio*  
Commissioner of Education

JOHN W. McCONNELL, B.A., PH.D., D.SC., *ex officio*  
President of the University

HAROLD E. HYDE, B.S., M.S., ED.D., *ex officio*  
President of Plymouth State College

ROMAN J. ZORN, B.ED., PH.D., *ex officio*  
President of Keene State College

DEAN P. WILLIAMSON, B.S., Concord (1960-1968)  
Chairman of the Board

FRED W. HALL, JR., B.S., LL.B., Rochester (1966-1969)  
Vice Chairman of the Board

NORMAN S. WEEKS, B.S., Laconia (1965-1969)  
Secretary of the Board

FRANK W. RANDALL, B.S., LL.D., Portsmouth (1936-1968)

MAURICE F. DEVINE, A.B., LL.B., LL.D., Manchester (1949-1970)

FORREST M. EATON, B.S., Portsmouth (1959-1967)

J. FRED FRENCH, Manchester (1961-1968)

SINCLAIR WEEKS, A.B., LL.D., Lancaster (1961-1969)

ALBERT R. FURLONG, B.E., M.E., Keene (1963-1967)

DOUGLAS L. ROBERTSON, B.ED., M.ED., Plymouth (1963-1967)

NORMAN C. BERUBE, B.A., M.D., Manchester (1963-1967)

RICHARD BLALOCK, Portsmouth (1963-1967)

GEORGE R. HANNA, B.A., LL.B., Keene (1963-1967)

MILDRED McAFEE HORTON, B.A., M.A., Randolph (1963-1967)

EUGENE C. STRUCKHOFF, A.B., LL.B., Concord (1963-1967)

BERNARD I. SNIERSON, A.B., LL.B., Laconia (1963-1967)

RICHARD W. DALAND, B.S., Durham (1966-1970)

RAY HOWLAND, JR., Stratham (1966-1970)

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# Officers of Administration

---

- JOHN W. McCONNELL, PH.D., *President*  
JERE A. CHASE, M.ED., *Executive Vice President*  
NORMAN W. MYERS, B.S., *Vice President-Treasurer*  
ROBERT F. BARLOW, PH.D., *Academic Vice President*  
ROBERT N. FAIMAN, PH.D., *Dean of the College of Technology and  
Director of the Engineering Experiment Station*  
HARRY A. KEENER, PH.D., *Dean of the College of Agriculture  
and Director of the Agricultural Experiment Station*  
EVERETT B. SACKETT, PH.D., *Dean of the College of Liberal Arts*  
EUGENE S. MILLS, PH.D., *Dean-elect of the College of Liberal Arts*  
KENNETH J. ROTHWELL, PH.D., *Associate Dean of the Whittemore School  
of Business and Economics*  
JAN E. CLEE, PH.D., *Dean-elect of the Whittemore School of Business  
and Economics*  
WILLIAM H. DREW, PH.D., *Acting Dean of the Graduate School*  
PIERRE D. BOY, B.S., *Professor of Military Science*  
BUD BARBEE, M.A., *Professor of Aerospace Studies*  
GORDON O. THAYER, ED.D., *Director of the Division of Industrial  
and Community Services*  
DANIEL A. FERBER, PH.D., *Director of Development*  
C. ROBERT KEESEY, B.A., *Dean of Students*  
DONALD E. VINCENT, A.M.L.S., A.M., *Librarian*  
OWEN B. DURGIN, M.A., *Registrar*  
LESLIE L. LAFOND, M.ED., *Director of Admissions*  
KEITH J. NICHBERT, B.A., *Station Manager of WENH-TV*  
HARRY P. DAY, PH.D., *Director of the New England Center  
for Continuing Education*

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# Faculty

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As of February 1, 1967

ABELL, MAX F., *Extension Associate Professor Emeritus of Agricultural Economics*

B.S., Cornell University, 1914; PH.D., *ibid.*, 1924. (1926- )

BABCOCK, DONALD C., *Professor Emeritus of Philosophy*

B.A., University of Minnesota, 1907; M.A., *ibid.*, 1908; S.T.B., Boston University, 1912; D.H.L., (Hon.), University of New Hampshire, 1960. (1918- )

BARRACLOUGH, KENNETH E., *Professor Emeritus of Forestry*

B.A., New York State College of Forestry, Syracuse University, 1921; M.F., Harvard University, 1940. (1926- )

BOWLES, ELLA S., *Publications Editor Emeritus*

Plymouth Normal School, 1905. (1943- )

BRACKETT, THELMA, *University Librarian Emeritus*

A.B., University of California, 1919; Certificate, California State Library School, 1920; D.H.L. (Hon.), University of New Hampshire, 1962. (1942- )

CAMPBELL, WILLIS C., *Research Associate Emeritus, Engineering Experiment Station*

B.S., New Hampshire College, 1906. (1938- )

CARROLL, HERBERT A., *Professor Emeritus of Psychology*

A.B., Bates College, 1923; A.M., Brown University, 1928; PH.D., Columbia University, 1930. (1941- )

CORTEZ, EDMUND A., *Professor Emeritus of Speech*

B.A., Taylor University, 1923; B.O., Asbury College, 1924; B.D., Asbury Theological Seminary, 1924; M.A., Columbia University, 1926; ED.M., Harvard University, 1927. (1927- )

COULTER, CHARLES W., *Professor Emeritus of Sociology*

B.A., University of Toronto, 1908; B.D., Victoria College, 1909; M.A., Yale University, 1910; PH.D., *ibid.*, 1914. (1934- )

DEQUOY, RUTH W., *Associate State 4-H Leader Emeritus*

B.A., New Hampshire College, 1921; M.ED., University of Maryland, 1953. (1929- )

ELLIS, ELIZABETH E., *Extension Associate Professor Emeritus of Home Economics*

B.S., Teachers College, Columbia University, 1927; M.A., *ibid.*, 1929. (1929- )

GRINNELL, HAROLD C., *Dean Emeritus, College of Agriculture and Professor Emeritus of Resource Economics*

B.S., Cornell University, 1921; M.S., *ibid.*, 1930; PH.D., *ibid.*, 1941. (1932- )

\* Indicates time devoted to Cooperative Extension Service.

† Indicates time devoted to Agricultural Experiment Station.

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- 
- HENNESSY, WILLIAM G., *Professor Emeritus of English*  
A.B., Boston University, 1916; A.M., *ibid.*, 1924; D.F.A. (Hon.), Transylvania College, 1966. (1923- )
- HITCHCOCK, LEON W., *Professor Emeritus of Electrical Engineering*  
B.S., Worcester Polytechnic Institute, 1908. (1910- )
- HOWES, HORACE L., *Professor Emeritus of Physics*  
B.S., Syracuse University, 1905; PH.D., Cornell University, 1915. (1918- )
- HUDDLESTON, ERIC T., *Professor Emeritus of Architecture*  
B.A.R.C.H., Cornell University, 1910. (1914- )
- IDDLES, HAROLD A., *Professor Emeritus of Chemistry*  
B.S., Michigan State College, 1918; M.S., University of Iowa, 1921; PH.D., Columbia University, 1925; D.S.C. (Hon.), University of New Hampshire, 1966. (1929- )
- JACKSON, C. FLOYD, *Professor Emeritus of Zoology*  
B.A., DePauw University, 1905; M.S., Ohio State University, 1907; D.S.C. (Hon.), University of New Hampshire, 1961. (1908- )
- JOHNSON, ARTHUR W., *Professor Emeritus of Business and Economics*  
B.B.A., College of Business Administration, Boston University, 1922; M.B.A., *ibid.*, 1929; C.P.A. (1920- )
- JOHNSON, G. REID, *Associate Professor Emeritus of History*  
A.B., Muskingum College, 1916; M.A., Princeton University, 1920; PH.D., University of Edinburgh, 1922. (1932- )
- LATIMER, L. PHELPS, *Associate Professor Emeritus of Horticulture*  
B.S., University of California, 1921; M.S., *ibid.*, 1922; PH.D., *ibid.*, 1926. (1926- )
- LAVINE, IRVIN, *Professor Emeritus of Chemical Engineering*  
B.S., University of Minnesota, 1924; PH.D., *ibid.*, 1930. (1948-49, 1951- )
- MANTON, ROBERT W., *Professor Emeritus of Music*  
Harvard University, 1918. (1923- )
- MILLS, MARIAN E., *Assistant Professor Emeritus of Botany*  
B.S., Teachers College, Columbia University, 1917; M.A., *ibid.*, 1920. (1927- )
- MORROW, KENNETH S., *Professor Emeritus of Dairy Science*  
B.S., University of Minnesota, 1918; M.S., *ibid.*, 1925. (1934- )
- O'BRIEN, DANIEL A., *County Agent Leader Emeritus*  
B.S., Cornell University, 1913. (1920- )
- O'CONNELL, ELIAS M., *Instructor Emeritus in Mechanical Engineering*  
Graduate, Wentworth Institute, 1923; Graduate, two-year course in pattern making, *ibid.*, 1925. (1925- )
- O'KANE WALTER C., *Professor Emeritus of Economic Entomology*  
B.A., Ohio State University, 1897; M.A., *ibid.*, 1909; D.S.C. (Hon.), *ibid.*, 1932. (1909- )
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- PARKER, CLIFFORD S., *Professor Emeritus of Languages*  
A.B., Harvard University, 1912; A.M., *ibid.*, 1914; PH.D., Columbia University, 1925; D.H.L. (Hon.), University of New Hampshire, 1964. (1931- )
- PERRY, ERROL C., *Assistant Professor Emeritus of Farm Management, Thompson School of Agriculture*  
B.S., Massachusetts State College, 1920. (1929-42, 1946- )
- PHILLIPS, THOMAS G., *Professor Emeritus of Agricultural and Biological Chemistry*  
B.S., Ohio State University, 1912; M.S., *ibid.*, 1913; PH.D., University of Chicago, 1918. (1925- )
- PRINCE, FORD S., *Professor Emeritus of Agronomy*  
B.S., University of Illinois, 1913. (1925- )
- RASMUSSEN, EDWIN J., *Extension Professor Emeritus of Horticulture*  
B.S., University of Wisconsin, 1927; M.S., *ibid.*, 1929. (1929-36, 1947- )
- RICHARDSON, EDYTHE T., *Professor Emeritus of Zoology*  
B.S., New Hampshire College, 1922; M.S., University of New Hampshire, 1924. (1922- )
- SEIBERLICH, JOSEPH, *Research Professor Emeritus, Engineering Experiment Station*  
Diploma Ingenieur, Technical University, Karlsruhe, Germany, 1924; Doctor Ingenieur, *ibid.*, 1928. (1941- )
- SHIMER, STANLEY R., *Professor Emeritus of Biochemistry*  
B.S., Muhlenberg College, 1918; M.S., Pennsylvania State College, 1923. (1924- )
- SKELTON, RUSSELL R., *Professor Emeritus of Civil Engineering*  
B.S., Purdue University, 1924; C.E., *ibid.*, 1934; S.M., Harvard University, 1939. (1928- )
- SMITH, TODD O., *Research Assistant Professor Emeritus of Agricultural and Biological Chemistry*  
A.B., Indiana University, 1910; M.S., New Hampshire College, 1917. (1910- )
- STEVENS, CLARK L., *Professor Emeritus of Forestry*  
B.S., New Hampshire College, 1917; M.F., Yale University, 1926; PH.D., *ibid.*, 1930. (1919- )
- STEVENS, HENRY B., *Director Emeritus of University Extension Service*  
A.B., Dartmouth College, 1912. (1918- )
- SWASEY, HENRY C., *Associate Professor Emeritus of Physical Education and Athletics for Men*  
B.S., Amherst College, 1915; M.S., Indiana University, 1941. (1921- )
- THAMES, SARAH, *Associate Professor Emeritus of Home Economics*  
B.S., Simmons College, 1930; M.A., Teachers College, Columbia University, 1942. (1945- )
-



- 
- TIRRELL, LORING V., *Professor Emeritus of Animal Science*  
B.S., Massachusetts Agricultural College, 1920; M.S., Massachusetts State College, 1941. (1921-25, 1930- )
- TYRRELL, DORIS E., *Associate Professor Emeritus of Secretarial Studies*  
B.S., University of Minnesota, 1926; M.A., *ibid.*, 1932. (1938- )
- WALSH, JOHN S., *Professor Emeritus of Languages*  
A.B., Harvard University, 1915; A.M., Boston University, 1928; D.H.L. (Hon.), University of New Hampshire, 1965. (1922- )
- YALE, WILLIAM, *Professor Emeritus of History*  
PH.D., Sheffield Scientific School, Yale University, 1910; M.A., University of New Hampshire, 1928. (1928- )
- 
- ABBOTT, HELEN D., *Head Cataloger*  
A.B., Wheaton College, 1929; S.B. in L.S., Simmons College, 1930; A.M., Middlebury College, 1939. (1943- )
- ABBOTT, MARGUERITE, *Associate Professor of Occupational Therapy*  
Certificate, O.T.R., Boston School of Occupational Therapy, 1932; B.S., Tufts University, 1948; M.A., Columbia University, 1957; A.P.D.ED., *ibid.*, 1961, Adv. Prof. Deg. Ed., Columbia University, 1961. (1961- )
- AGENBROAD, JAMES E., *Senior Cataloger*  
A.B., Miami University, 1956; M.L.S., Rutgers University, 1960. (1960- )
- AGENBROAD, JEAN ANN, *Children's Librarian*  
A.B., Berea College, 1959; M.L.S., Rutgers University, 1962. (1966- )
- ALDRICH, DOROTHY E., *Lecturer in Speech and Drama*  
A.B., Tufts University, 1936; M.A., University of Pittsburgh, 1965. (1966- )
- ALLEN, BRUCE D., *Instructor in English*  
B.A., Boston University, 1959. (1964- )
- †ALLEN, FRED E., *Professor of Animal Science and Veterinarian*  
B.S., University of New Hampshire, 1932; D.V.M., Ohio State University, 1936 (1940- )
- ALLISON, RICHARD C., *Assistant Professor of Forest Technology, Thompson School of Applied Science*  
B.S., Pennsylvania State University, 1957; M.F., *ibid.*, 1960. (1962- )
- ALLMENDINGER, E. EUGENE, *Associate Professor of Mechanical Engineering*  
B.S., Nav. Arch., University of Michigan, 1941; M.S., Mech. Eng., University of New Hampshire, 1950. (1958- )
- AMELL, ALEXANDER R., *Professor of Chemistry*  
B.S., University of Massachusetts, 1947; PH.D., University of Wisconsin, 1950. (1955- )
- AMMAN, WILLIAM, M.D., *Lecturer in Occupational Therapy*  
M.R.C.S., L.R.C.P., University College Hospital, 1937; Diploma of Public Health, 1944, University of Cape Town, L.M.C.C., Canada, 1950. (1965- )
-



- ANDERSEN, KENNETH K., *Associate Professor of Chemistry*  
B.S., Rutgers University, 1955; PH.D., University of Minnesota, 1959. (1960- )
- ANDERSON, CHARLOTTE K., *Assistant Librarian and Documents Librarian*  
B.A., University of Michigan, 1935; A.B.L.S., *ibid.*, 1936; A.M.L.S., *ibid.*, 1951.  
(1943- )
- ANDERSON, EDWIN J., *Instructor in Geology*  
A.B., Cornell University, 1961; M.S., Brown University, 1964. (1965- )
- ANDREW, MICHAEL D., *Assistant Professor of Education*  
B.S., Cornell University, 1960; A.M.T., Harvard University, 1961. (1966- )
- †ANDREWS, RICHARD A., *Associate Professor of Resource Economics*  
B.S., University of Maine, 1949; M.S., Pennsylvania State University, 1951;  
PH.D., University of Minnesota, 1959. (1959- )
- ANNIS, WILLIAM H., *Associate Professor of Agricultural Education*  
B.S., University of Maine, 1951; M.AGRIC.ED., University of New Hampshire, 1959; ED.D., Cornell University, 1961. (1962- )
- ARCHAMBAULT, RAYMOND R., *Cataloger*  
B.A., University of Maine, 1949; M.S., Syracuse University, 1959. (1965- )
- ARNDT, KARL SIEGFRIED NORMAN, *Assistant Professor of German*  
A.B., Brown University, 1960; M.A., University of Connecticut, 1963;  
PH.D., *ibid.*, 1966. (1966- )
- ARNOLD, CHARLES G., *Assistant Professor of Physical Education*  
B.S., Springfield College, 1951; M.S., *ibid.*, 1952. (1966- )
- ATWOOD, JANET, *Assistant Professor of Physical Education*  
B.S., Skidmore College, 1950; M.A., State University of Iowa, 1955. (1962- )
- AULTMAN, DWIGHT E., III, *Instructor-Physical Therapist Trainer*  
B.S., Medical College of Virginia, 1956. (1966- )
- AUSTIN, GILBERT R., *Assistant Professor of Education*  
B.S., Central Connecticut College, 1953; M.A.L.S., Wesleyan University, 1956; C.A.G.S., University of Hartford, 1959; PH.D., University of Connecticut, 1965. (1965- )
- AZZI, VICTOR D., *Associate Professor of Mechanical Engineering*  
B.S., University of New Hampshire, 1955; D.ENG., Yale University, 1961.  
(1965- )
- BACH, DIRK P., *Instructor in The Arts*  
B.F.A., Colgate University, 1961; M.A., University of Denver, 1962; M.A., University of Michigan, 1964. (1965- )
- BAIER, LEE S., *Assistant Professor of English*  
B.A., Reed College, 1948; Columbia University, 1952; PH.D., *ibid.*, 1965.  
(1960- )
- BALDERACCI, ARTHUR E., *Instructor in The Arts*  
A.B., Duke University, 1960; M.F.A., University of Georgia, 1965. (1965- )

- 
- BALOMENOS, RICHARD H., *Associate Professor of Mathematics*  
B.S., United States Merchant Marine Academy, 1952; M.A., New York University, 1956; ED.D., Harvard University, 1961. (1961- )
- BARBEE, BUD, *Lieutenant Colonel, Professor of Aerospace Studies*  
B.A., Washington University, 1940; M.A., *ibid.*, 1949. (1966- )
- BARDWELL, JOHN D., *Director, Audio-Visual Center and Media Specialist for the New England Regional Center*  
A.A., Boston University, 1950; B.S., Gorham State Teachers College, 1952; M.ED., University of New Hampshire, 1955. (1960- )
- BARLOW, ROBERT F., *Academic Vice President and Professor of Economics*  
B.A., Colby College, 1950; M.A., Fletcher School of Law and Diplomacy, 1951; PH.D., *ibid.*, 1960. (1962- )
- BARR, GEORGE E., *Instructor in English*  
B.A., Baldwin Wallace College, 1963. (1965- )
- BARSTOW, THOMAS R., *Instructor in Physical Education*  
B.S., St. Lawrence University, 1961; M.ED., *ibid.*, 1965. (1965- )
- †BARTLEY, CLARA H., *Research Associate in Microbiology*  
B.S., Miami University, 1923; M.A., University of Michigan, 1926; PH.D., University of Kansas, 1935. (1945- )
- BARTLEY, IRVING D., *Associate Professor of Music and University Carillonneur*  
B.M., Syracuse University, 1935; M.M., *ibid.*, 1938. (1945- )
- BARTON, PHILIP S., *Professor of Applied Animal Science and Director, Thompson School of Applied Science*  
B.S., University of New Hampshire, 1928; M.ED., *ibid.*, 1938. (1939- )
- BATCHELDER, GERALD M., *Research Associate Professor, Engineering Experiment Station*  
B.S., University of New Hampshire, 1950; M.S.C.E., Purdue University, 1952. (1953- )
- BATCHELLER, JOSEPH D., *Professor of Speech and Drama*  
A.B., Carnegie Institute of Technology, 1936; A.M., University of Minnesota, 1938; PH.D., *ibid.*, 1942. (1944- )
- BATHO, EDWARD H., *Professor of Mathematics*  
B.S., Fordham University, 1950; M.S., University of Wisconsin, 1952; PH.D., *ibid.*, 1955. (1960- )
- BEASLEY, WAYNE M., *Research Associate Professor, Engineering Experiment Station, and Adjunct Associate Professor of Materials Science*  
S.B., Harvard College, 1945; S.M., Massachusetts Institute of Technology, 1965. (1957- )
- BETCHELL, HOMER F., JR., *Associate Professor of Mathematics*  
B.S., Grove City College, 1951; M.A., University of Wisconsin, 1956; *ibid.*, 1963. (1966- )
-

- BECKETT, JOHN A., *Forbes Professor of Management*  
B.S., University of Oregon, 1939; M.B.A., Harvard University, 1946; C.P.A. (Washington, Illinois, Massachusetts, and New Hampshire). (1962- )
- \*†BECKMAN, JERE R., *Assistant Professor of Animal Science*  
B.S., University of New Hampshire, 1956; M.S., *ibid.*, 1959; D.V.M., University of California, 1963. (1964- )
- BECKWITH, MARION C., *Chairman, Department of Physical Education for Women, and Professor of Physical Education*  
A.B., Oberlin College, 1935; M.ED., University of New Hampshire, 1937. (1935- )
- BELL, R. VIRGINIA, *Assistant Professor of Occupational Therapy*  
B.S., University of Michigan, 1953; Certificate O.T.R., Boston School of Occupational Therapy, 1955. (1958- )
- BERNEY, CHARLES V., *Assistant Professor of Chemistry*  
B.S., Whitman College, 1953; PH.D., University of Washington, 1962. (1965- )
- BHATTACHARYYA, JNANABRATA, *Research Associate in Chemistry*  
B.S., Presidency College, 1955; M.S., *ibid.*, 1958; PH.D., Calcutta University, 1964. (1966- )
- BINGHAM, SYLVESTER H., *Professor of English*  
A.B., Dartmouth College, 1922; A.M., Harvard University, 1929; PH.D., Yale University, 1937. (1936- )
- BJORKMAN, RUBEN E., *Head Hockey Coach and Instructor in Physical Education*  
B.S., University of Minnesota, 1951. (1964- )
- BLANCHARD, FLETCHER A., JR., *Associate Professor of Electrical Engineering*  
B.S., Union College, 1948; M.S. IN E.E., Lehigh University, 1950. (1950- )
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B.F.A., Massachusetts College of Arts, 1964; M.F.A., New York State College of Ceramics, 1966. (1966- )

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B.A., Park College, 1938; M.S., Texas Agricultural and Mechanical College, 1940; PH.D., Pennsylvania State College, 1947. (1947- )

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Graduate of University of Helsinki, 1963. (1966- )

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(1966- )
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B.S.M.E., Case Institute of Technology, 1956; M.S.M.E., Massachusetts Institute of Technology, 1959; PH.D., Case Institute of Technology, 1964.  
(1964- )
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B.A., Washington State, 1961; M.A., *ibid.*, 1965. (1965- )
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B.A., Adelphi University, 1960. (1966- )
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A.B., Adelphi College, 1958; M.S., University of Miami, 1960; PH.D., Emory University, 1966. (1966- )
- CUSHING, DANIEL, *Honorary Fellow in Metallurgy*  
PH.B., Yale University, 1912. (1952- )
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- DAGGETT, ALBERT F., *Professor of Chemistry*  
 B.S., University of New Hampshire, 1928; M.S., *ibid.*, 1930; PH.D., Columbia University, 1934. (1928-31, 1935- )
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 B.ED., Plymouth Teachers College, 1956; M.S., Colby College, 1964.
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 A.B., New York University, 1928; A.M., *ibid.*, 1929. (1948- )
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 B.A., Western Reserve University, 1956; Certification, Naval Intelligence School, 1958; M.A., University of Denver, 1961. (1962- )
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 B.A., University of Delaware, 1955; M.A., Western Reserve University, 1956. (1963- )
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 B.S., University of New Hampshire, 1932; M.S., *ibid.*, 1934. (1932- )
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 B.S., Central Missouri State Teachers College, 1939; M.A., State University of Iowa, 1945. (1945- )
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 B.C.E., Ohio State University, 1930; M.S., *ibid.*, 1940. (1930- )
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 B.A., Albion College, 1962; M.A., University of Wisconsin, 1964. (1966- )
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 A.B., University of Kansas, 1925; M.B.A., New York University, 1927. (1928- )
- DESROSIER, RICHARD V., *Instructor in Classics*  
 A.B., Boston College, 1960; A.M., University of Wisconsin, 1961. (1965- )
- DEWEY, RICHARD S., *Professor of Sociology*  
 A.A., Pasadena Jr. College, 1934; A.B., College of Wooster, 1936; M.A., Oberlin College, 1939; PH.D., University of Wisconsin, 1941. (1958- )
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 B.S., University of New Hampshire, 1951; M.D., University of Vermont, 1955. (1965- )
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B.S., University of Vermont, 1936; M.AGR.ED., University of New Hampshire, 1960. (1953- )
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B.A., Swarthmore College, 1948; A.M., Harvard University, 1950; PH.D., *ibid.*, 1961. (1964- )
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B.S., University of Wisconsin, 1921. (1926- )
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B.S., University of Dayton, 1960; M.S., Arizona State University, 1962; PH.D., *ibid.*, 1964. (1965- )
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S.B., Harvard University, 1942; Cert. of Ethn., University of Paris, 1949; PH.D., University of Leiden, 1956. (1962- )
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B.A., University of Wisconsin, 1948; M.A., *ibid.*, 1949; PH.D., *ibid.*, 1957. (1964- )
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B.S., Pennsylvania State College, 1947; M.S., Rutgers University, 1949; PH.D., Vanderbilt University, 1961. (1956- )
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B.S., University of New Hampshire, 1955. (1964- )
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B.A., Grinnell College, 1960; M.S., Iowa State University, 1962. (1966- )
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D.V.M., V.S., Ontario Veterinary College, 1938. (1950- )

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*ibid.*, 1951. (1951- )
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B.S.S., The City College, New York, 1942; M.A., Columbia University, 1948; PH.D., *ibid.*, 1955. (1958- )
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Technology, 1955; M.S., University of New Hampshire, 1956; SC.D., Massa-  
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B.A., State University of Iowa, 1961; M.S., University of North Carolina,  
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B.F.A., Syracuse University, 1948; M.A.T., Indiana University, 1954. (1954- )
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B.A., St. Anselm's College, 1940; M.A., University of New Hampshire,  
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B.S., Western Kentucky State College, 1958; M.A., University of Kentucky,  
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B.S., University of New Hampshire, 1947. (1966- )
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M.S., University of New Hampshire, 1964. (1966- )
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Rochester Institute of Technology, 1948. (1948- )
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B.A., University of New Hampshire, 1950; M.A., *ibid.*, 1958. (1958- )
- WILLITS, ROBIN D., *Associate Professor of Business Administration*  
A.B., Middlebury College, 1947; B.S., Massachusetts Institute of Technology, 1948; PH.D., *ibid.*, 1965. (1965- )
- WILSON, JOHN A., *Assistant Professor of Mechanical Engineering*  
B.S. IN M.E., Tufts University, 1958; M.S., IN M.E., Northeastern University, 1960. (1960- )
- WINN, ALDEN L., *Professor of Electrical Engineering*  
B.S., University of New Hampshire, 1937; S.M., Massachusetts Institute of Technology, 1948. (1948- )
- WITTHOFT, WILLIAM G., *Assistant Professor of Mathematics*  
PH.B., University of Chicago, 1947; S.B., *ibid.*, 1955; M.S., DePaul University, 1957; S.M., University of Chicago, 1958; PH.D., Illinois Institute of Technology, 1963. (1964- )
- \*WOELFEL, CHRIS G., *Assistant Professor of Dairy Science*  
B.S., University of Wisconsin, 1958; M.S., University of Maine, 1960. (1964- )
- WOLSTAT, HENRY, M.D., *Lecturer in Occupational Therapy*  
M.D., University of Toronto, 1959. (1966- )

- WOODRUFF, JOHN H., *Associate Professor of Government*  
B.A., Pomona College, 1949; M.A., Fletcher School of Law and Diplomacy, 1952; PH.D., Boston University, 1961. (1966- )
- WOODRUFF, RUTH J., *Professor of Economics*  
A.B., Bryn Mawr, 1919; A.M., *ibid.*, 1920; PH.D., Radcliffe College, 1931. (1931- )
- WOOSTER, CAROLINE S., *Associate Professor of Physical Education*  
Sargent School for Physical Education, 1926; B.S., University of New Hampshire, 1934. (1944- )
- WRAY, CLAYTON J., *Assistant Professor of Forest Technology, Thompson School of Applied Science*  
B.S., Washington State University, 1950; M.F., Duke University, 1951. (1965- )
- †WRIGHT, PAUL A., *Professor of Zoology*  
S.B., Bates College, 1941; A.M., Harvard University, 1942; PH.D., *ibid.*, 1944. (1958- )
- WRIGHTSMAN, DWAYNE E., *Assistant Professor of Finance*  
B.S., Manchester College, 1958; M.B.A., Indiana University, 1959; PH.D., Michigan State University, 1964. (1964- )
- WURZBURG, FREDERIC W., *Associate Professor of Political Science*  
B.S., Columbia University, 1956; PH.D., *ibid.*, 1961. (1963- )
- †WYBOURN, MARJORY A., *Professor of Home Economics*  
B.S., University of Washington, 1944; M.A., Teachers College, Columbia University, 1948; ED.D., *ibid.*, 1958. (1962- )
- YANG, JANE C., *Cataloger*  
B.ED., Taiwan Normal University; M.S., Southern Illinois University, 1961; M.S.L.S., Pratt Institute, 1963. (1966- )
- YANG, WEI TSENG, *Assistant Professor in Mechanical Engineering*  
B.S., National Sun Yat-sen University, 1945; M.S., Michigan College of Mining and Technology, 1958; D.ENG., Yale University, 1963. (1963- )
- YEN, YIN-CHAO, *Adjunct Associate Professor of Chemical Engineering*  
B.S., National Taiwan University, 1951; M.S., Kansas State University, 1956; PH.D., Northwestern University, 1960. (1965- )
- YOUNT, JOHN A., *Assistant Professor of English*  
B.A., Vanderbilt University, 1960; M.F.A., State University of Iowa, 1962. (1962-1964; 1965- )
- YUKICA, JOSEPH M., *Head Football Coach and Instructor in Physical Education*  
B.S., Pennsylvania State University, 1954; M.ED., *ibid.*, 1957. (1966- )
- ZIMMERMAN, OSWALD T., *Professor of Chemical Engineering*  
B.S.E., University of Michigan, 1929; M.S.E., *ibid.*, 1931; PH.D., *ibid.*, 1934. (1938- )

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ZOLLER, J. HAROLD, *Professor of Civil Engineering*

B.S.C.E., University of Wyoming, 1941; B.S.S.E., University of Illinois, 1945;

PH.D., University of Wisconsin, 1953. (1958- )

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## Professional Staff

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BALLARD, HORACE C., *Agricultural Agent, Belknap County*

B.S., Cornell University, 1936. (1949- )

BOOSKA, EMERY P., *Assistant to the Dean, College of Agriculture*

B.S., University of Vermont, 1956. (1966- )

BOURNE, ELIZABETH, *4-H Youth Development Agent, Rockingham County*

DIPLOMA, Framingham Normal School, 1924. (1926- )

BRECK, ROBERT W., *Forester, Hillsborough County*

B.S., University of New Hampshire, 1940; M.F., Yale School of Forestry, 1941. (1947- )

BUCK, CHARLES W., *4-H Youth Development Agent, Hillsborough County*

B.S., University of Maine, 1951. (1955- )

BUTTERFIELD, MARCIUS R., *4-H Youth Development Agent, Cheshire County*

B.S., University of Vermont, 1958. (1962- )

CILLEY, HERBERT L., *Greenhouse Superintendent*

B.S., University of New Hampshire, 1948; M.S., *ibid.*, 1965. (1965- )

CLARK, VIRGINIA E., *Associate 4-H Youth Development Agent, Merrimack County*

B.E., Keene State College, 1942. (1963- )

CLARKE, E. WARREN, *Coordinator, Civil Defense Training Program*

A.B., Franklin College of Indiana, 1950; B.D., Andover-Newton Theological School, 1954. (1964- )

CLIFFORD ROBERT L., *4-H Youth Development Agent, Belknap County*

B.S., University of New Hampshire, 1957. (1960- )

COLBY, PERLEY D., *Agricultural Agent, Hillsborough County*

B.S., University of New Hampshire, 1952. (1953- )

COLBY, STANLEY W., *Agricultural Agent, Sullivan County*

B.S., University of New Hampshire, 1934. (1940- )

COMERFORD, EDWARD V., *Agricultural Agent, Cheshire County*

B.S., University of New Hampshire, 1937. (1945- )

CORROW, HENRY W., JR., *Editor, Cooperative Extension Service*

B.S., Boston University, 1948. (1953- )

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- CURRIER, MURIEL B., *Extension Home Economist, Grafton County*  
B.S., Farmington State Teachers College, 1939. (1951-52, 1953- )
- CUTTER, ARTHUR H., *Agricultural Agent, Strafford County*  
B.S., University of New Hampshire, 1936; M.E., *ibid.*, 1956. (1955- )
- DAMON, JOHN F., *Agricultural Agent, Carroll County*  
B.S., University of New Hampshire, 1961. (1961- )
- DANKO, THOMAS, *Poultry Area Agent, Belknap, Cheshire, Hillsboro, and Merrimack Counties*  
B.S., University of Massachusetts, 1952. (1957- )
- DAVIS, MARION S., *Extension Home Economist, Sullivan County*  
B.E., Keene Normal School, 1929. (1937- )
- DENISON, ELLEN L., *Extension Home Economist, Coos County*  
B.S., Framingham Teachers College, 1928; M.P.H., Massachusetts Institute of Technology, 1930. (1955- )
- DESRISSAUX, LOUIS R., *Emergency Operations Instructor, Civil Defense Training Program*  
B.S., Fordham University, 1946. (1966- )
- DODGE, ARTHUR G., JR., *Forester, Carroll County*  
A.A., Boston University, 1950; B.S. IN FORESTRY, University of Massachusetts, 1953; M.S.F., Harvard University, 1961. (1960- )
- EVANS, ROBERT E., *Rural Civil Defense Coordinator*  
B.S., Pennsylvania State University, 1938; M.S., *ibid.*, 1946. (1963- )
- FABRIZIO, RICHARD F., *4-H Youth Development Agent, Grafton County*  
B.V.A., University of Massachusetts, 1959. (1965- )
- FENTON, PAUL J., *Agricultural Agent, Merrimack County*  
B.S., University of New Hampshire, 1929; M.S., Cornell University, 1941. (1952- )
- FERGUSON, JOHN R., JR., *Forester, Cheshire County*  
B.S., University of New Hampshire, 1960. (1965- )
- FIELD, KENNETH A., JR., *Resources Management Instructor, Civil Defense Training Program*  
B.A., University of New Hampshire, 1950. (1965- )
- GEORGE, ERNEST A., *Dairy Area Agent, Hillsboro, Merrimack, and Rockingham Counties*  
B.S., University of New Hampshire, 1951. (1955- )
- HALL, JAMES W., *Dairy Area Agent, Belknap, Carroll, Coos, and Strafford Counties*  
B.S., University of New Hampshire, 1957. (1959- )
- HAM, RUTH S., *Extension Home Economist, Strafford County*  
B.S., University of New Hampshire, 1924. (1927-33, 1942-44, 1955- )
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- HEAD, IVAN E., *4-H Youth Development Agent, Sullivan County*  
B.S., University of New Hampshire, 1951; M.AG.ED., *ibid.*, 1959. (1963- )
- JOHNSTON, ANN E., *Extension Home Economist, Cheshire County*  
B.S., University of Vermont, 1963. (1963- )
- JOSSELYN, DOROTHY, *Chemist*  
B.S., University of New Hampshire, 1958; M.S., *ibid.*, 1962. (1947- )
- KENNEDY, KEVIN B., *Dairy Area Agent, Cheshire, Grafton, and Sullivan Counties*  
B.S.A., Ontario Agricultural College, 1949. (1955- )
- KNOWLES, STANLEY W., *Forester, Rockingham County*  
B.S., University of New Hampshire, 1959. (1961- )
- KNOX, HARRY B., *Associate 4-H Youth Development Agent, Rockingham County*  
B.S., University of New Hampshire, 1950. (1954- )
- LEIGHTON, ROGER S., *Forester, Strafford County*  
B.S., University of New Hampshire, 1941. (1952- )
- LITTLEFIELD, RALPH B., *State Agricultural Agent Leader*  
B.S., University of New Hampshire, 1927. (1940- )
- MARCHANT, ESTELLA T., *Nursery School Supervisor*  
B.S., University of Rhode Island, 1943. (1966- )
- MICHAL, CAROL A., *Assistant 4-H Youth Development Agent, (on leave)*  
B.S., University of Connecticut, 1963. (1963- )
- MILLER, CARL R., *Radiological Defense Instructor, Civil Defense Training Program*  
B.S., University of Maine, 1962; M.S., Massachusetts Institute of Technology, 1964. (1965- )
- MONAHAN, DANIEL H., *Forester, Belknap County*  
B.S., University of New Hampshire, 1961; M.F., Yale School of Forestry, 1962. (1963- )
- NISSEN, HARRIET J., *Extension Home Economist, Hillsborough County*  
B.S., Nasson College, 1941; M.ED., Cornell University, 1953. (1956- )
- OUELLETTE, GERALD J., *County Forester-at-Large, Forest Recreation Business Specialist*  
B.S., University of New Hampshire, 1961; M.S., University of Massachusetts, 1965. (1966- )
- PIKE, RADCLIFFE B., *Horticulturist*  
A.B., Bowdoin College, 1950; M.S., University of New Hampshire, 1952. (1963- )
- PROUGH, ELIZABETH A., *4-H Youth Development Agent, Coos County*  
B.S., Pennsylvania State University, 1958. (1960- )
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- READ, JOYCE E., *Assistant 4-H Youth Development Agent, Grafton County*  
B.S., University of New Hampshire, 1966. (1966- )
- RICH, WAYNE S., *4-H Youth Development Agent, Merrimack County*  
B.S., University of Maine, 1934. (1946- )
- ROPER, ELIZABETH R., *4-H Youth Development Agent, Carroll County*  
B.A., University of New Hampshire, 1928. (1928- )
- RUTHERFORD, RICHARD R., *Agricultural Agent, Grafton County*  
B.S., University of New Hampshire, 1940. (1940-42, 1948- )
- SARGENT, JOHN E., *Forester, Coos County*  
B.S., University of New Hampshire, 1959. (1960- )
- SARGENT, LESLIE B., JR., *Forester, Grafton County*  
B.S., University of New Hampshire, 1943. (1954- )
- SNELL, EDWARD A., *4-H Youth Development Agent, Strafford County*  
B.S., University of New Hampshire, 1962. (1962- )
- STEARNS, JOSEPHINE S., *Associate 4-H Youth Development Agent, Hillsborough County*  
B.S., University of New Hampshire, 1958. (1960- )
- STEINER, ROBERT J., *Regional Rural Civil Defense Information Specialist*  
B.S., University of Connecticut, 1952; M.S., University of Rhode Island, 1966. (1966- )
- STEVENS, ROBERT A., *Program Specialist, 4-H Youth Development*  
B.S., University of New Hampshire, 1937. (1955- )
- STEWART, EDWINA P., *Assistant Extension Home Economist, Grafton County*  
B.S., Farmington State Teachers College, 1943. (1965- )
- STILES, DWIGHT G., *Agricultural Agent, Coos County*  
B.S., University of New Hampshire, 1942. (1958- )
- STIMSON, RUTH G., *Extension Home Economist, Rockingham County*  
B.S., University of New Hampshire, 1940; M.ED., *ibid.*, 1944. (1942- )
- STOCKING, MARION I., *Extension Home Economist, Carroll County*  
B.S., Simmons College, 1949. (1958- )
- SZYMUJKO, JOSEPH A., *Forester, Sullivan County*  
B.S., University of New Hampshire, 1954. (1957- )
- THOMPSON, WILBUR E., *Forester, Merrimack County*  
B.S., University of New Hampshire, 1927. (1945- )
- UPHAM, EDWARD F., *Agricultural Agent, Rockingham County*  
B.S., University of Massachusetts, 1953; M.S., *ibid.*, 1954. (1959- )
- WHITTAKER, DONALD A., *Poultry Farm Superintendent*  
B.S., University of New Hampshire, 1961. (1967- )
- WYMAN, CHRISTINE C., *Assistant 4-H Youth Development Agent, Strafford County*  
B.S., University of New Hampshire, 1944. (1963- )
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# Administrative Divisions

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## Admissions

LESLIE L. LAFOND, *Director*

## Agriculture, College of

HARRY A. KEENER, *Dean and Director of the Agricultural Experiment Station*

MATHIAS C. RICHARDS, *Associate Dean*

## Alumni Affairs

BURNELL V. BRYANT, *Director*

GEORGE W. BAMFORD, *Fund Director*

RICHARD C. PLUMER, *Editor*

MARY SEMITROS, *Recorder*

RODNEY D. GOULD, *Activities Director*

## Audio-Visual Center

JOHN T. BARDWELL, *Coordinator*

## Bookstore

ROBERT B. STEVENSON, *Manager*

## Computation Center

SHAN S. KUO, *Director*

## Cooperative Extension Service

SAMUEL W. HOITT, *Director*

## Counseling and Testing Service

ROBERT G. CONGDON, *Director*

KATHLEEN R. BECKINGHAM, *Supervisor of Testing*

## Development

DANIEL A. FERBER, *Director*

## Dining Services

JANE E. GRISWOLD, *Manager*

## Educational Research and Testing Services

GILBERT R. AUSTIN, *Director*

## Engineering Design and Analysis Laboratory

GODFREY N. SAVAGE, *Director*

## Engineering Experiment Station

LAURENCE E. WEBBER, ~~Associate~~ *Director*

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## Financial Aids

JANE B. STEARNS, *Financial Aids Officer*

## Graduate School

WILLIAM H. DREW, *Acting Dean*

DAVID W. ELLIS, *Acting Associate Dean*

## Health Service

CHARLES H. HOWARTH, M.D., *Director*

WILLIAM D. CRANDALL, M.D., *Assistant Director*

RICHARD CILLEY, M.D.

HARRIET G. NASON, R.N., *Supervisor of Nursing*

## Historical Records

PHILIP A. WILCOX, *Curator*

## Housing

FRANCIS H. GORDON, *Director*

## Industrial and Community Services

GORDON O. THAYER, *Director*

## Informational Services

L. FRANKLIN HEALD, *Director*

W. ARTHUR GRANT, *News Editor*

THOMAS H. SLAYTON, *Assistant News Editor*

CRAIG L. PRITCHARD, *Sports Information Director*

## Liberal Arts, College of

~~EVERETT B. SACKETT, Dean~~

EUGENE S. MILLS, *Dean-elect*

MELVILLE NIELSON, *Associate Dean*

CLAIRE WRIGHT, *Academic Counselor*

## Library

DONALD E. VINCENT, *Librarian*

## Memorial Union

RONALD C. BARRETT, *Director*

## New England Center for Continuing Education

HARRY P. DAY, *Director*

## Personnel, Non-Academic

OMER R. MORIN, *Director*

## Photo Service

RICHARD D. MERRITT, *University Photographer*

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## **Physical Education and Athletics**

GAVIN H. CARTER, *Chairman, Department of Physical Education for Men*  
MARION C. BECKWITH, *Chairman, Department of Physical Education for Women*  
ANDREW T. MOORADIAN, *Chairman, Department of Intercollegiate Athletics*

## **Physical Plant Development**

RICHARD M. BRAYTON, *Director*

## **Placement Service**

EDWARD J. DOHERTY, *Director*

## **President's Office**

JOHN W. McCONNELL, *President*  
JERE A. CHASE, *Executive Vice President*  
NORMAN W. MYERS, *Vice President-Treasurer*  
ROBERT F. BARLOW, *Academic Vice President*  
ARTHUR S. ADAMS, *Consultant to the President*  
W. ARTHUR GRANT, *Assistant to the President*

## **Printing Service**

REGINALD W. KING, *Manager*

## **Public Administration Service**

LAWRENCE W. O'CONNELL, *Director*

## **Purchasing**

RUSSELL C. SMITH, *Purchasing Agent*

## **Registrar**

OWEN B. DURGIN, *Registrar*

## **Reserve Officers Training Corps**

COL. PIERRE D. BOY, *Professor of Military Science*  
LT. COL. BUD BARBEE, *Professor of Aerospace Studies*

## **Resource Development Center**

WILLIAM F. HENRY, *Chairman*

## **Ritzman Animal Nutrition Laboratory**

NICHOLAS F. COLOVOS, *Nutritionist*

## **Service**

EUGENE H. LEAVER, *Superintendent of Properties*  
CLIFTON P. HILDRETH, *Security Officer*  
REGINALD C. AMAZEEN, *Chief of Campus Police*  
JOHN F. DONOVAN, *Fire Chief*

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## Students, Dean of

C. ROBERT KEESEY, *Dean of Students*

ELIZABETH A. MCQUADE, *Associate Dean*

RICHARD F. STEVENS, *Associate Dean*

## Summer Session

EDWARD J. DURNALL, *Director*

## Technology, College of

ROBERT N. FAIMAN, *Dean*

JOHN B. HRABA, *Associate Dean*

*Dr. David Ellis, Assoc. De*

## Thompson School of Applied Science

PHILIP S. BARTON, *Director*

## University Extension Service

EDWARD J. DURNALL, *Director*

## Whittemore School of Business and Economics

KENNETH J. ROTHWELL, *Associate Dean*

JAN E. CLEE, *Dean* ~~et~~



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General Information

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1967-68

Student Work Dean's Office  
Agric - Dean Richards  
Tech - Kattie Clemons 5-80  
Whit - Chattie Cheney.  
L A -  
T S A





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# Facts About the University

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## History

Founded in 1866, the University of New Hampshire began as the "New Hampshire College of Agriculture and the Mechanic Arts," located in Hanover as a part of Dartmouth College. In 1893 it moved to its present site in Durham. The new campus was made possible by Benjamin Thompson, a prosperous farmer who bequeathed his land and money to the State for this purpose. The estate was valued at \$800,000 when it was made available to the College in 1910.

The College prospered in Durham, and in 1923 the State Legislature granted it a new charter as the University of New Hampshire, composed of the Colleges of Agriculture, Liberal Arts, and Technology. The Graduate School was formally added in 1928, and the Whittemore School of Business and Economics in 1962. A year later, the University became a "multi-versity" when two former teachers' colleges were brought under the same Board of Trustees as the Durham campus.

In the 1966-67 academic year, the University at Durham had an enrollment of 6,000. The State Colleges at Keene and Plymouth had a combined enrollment of 3,000.

## Physical Plant

The University campus in Durham is 156 acres in size. There are 35 buildings devoted to administration, instruction, and research; and 19 residence halls for men and women. Total University lands — including athletic fields, farms, and woodlots — comprise 2,830 acres. The book value is more than \$31,000,000. Major construction projects of the past ten years:

*University Library*, housing 400,000 volumes, 2,800 periodicals, and a substantial microfilm collection.

*Paul Arts Center*, a \$2,250,000 structure with separate wings for music, drama, and the arts.

*Spaulding Life Science Building*, with facilities for the departments of Biochemistry, Microbiology, and Zoology.

*Physical Education Facility*, with indoor track and pool, and *Snively Arena*, an indoor hockey rink, recently completed at a cost of \$3,600,000.

*Parsons Hall*, the first phase of which was completed in 1966, providing completely new facilities for the Department of Chemistry.

Other new buildings since 1946 include the University's engineering building, student recreation center, nutrition laboratory, twelve residence halls, a dining hall, and housing for married students and faculty.

## Service and Research

The *Division of Industrial and Community Services* coordinates the University's many service activities. One of the largest of the units engaged

## General Information

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in such work is the *Agricultural Experiment Station*, which conducts research, publishes the results, and provides testing services for New Hampshire farmers. A similar service for New Hampshire industry is provided by the *Engineering Experiment Station*.

The *Cooperative Extension Service*, operating in conjunction with the U. S. Department of Agriculture, bridges the gap between campus research and the people of the state. Formal adult education is conducted by the *University Extension Service*, which offers credit and non-credit courses anywhere in the state where there is sufficient demand.

The University operates New Hampshire's educational television station, *WENH-TV*, which broadcasts in-school programs for elementary and secondary schools, as well as cultural and educational programs during the evening hours. The *New England Center for Continuing Education*, a research and service facility sponsored by the six New England state universities, is located on the campus. In use at present is a headquarters building from which Center programs are planned and directed.

Other University units which place their resources at the service of the state: the *Resources Development Center*, which seeks to bring the talents and techniques of the social scientist into closer partnership with state and local governments; the *Public Administration Service*, which specifically helps town and city governments; the *Water Resources Research Center*, coordinating research projects to conserve and develop the state's water supply; and the *Bureau of Educational Research and Testing*. The *New Hampshire State Entomologist* and *State Geologist* are University faculty members with offices on campus.

Research in *Oceanography* is carried on in the biological, physical, and engineering sciences, and a number of departments offer courses which permit development of programs oriented toward marine science and engineering.

Among the University's specialized research facilities are the *Space Physics Center* in DeMeritt Hall, the *Ritzman Animal Nutrition Laboratory*, and the *Computation Center* in Kingsbury Hall.

## Cultural Activities

With two theaters, two art galleries, and auditoriums seating up to 5,000 persons, the University is a major cultural resource for New Hampshire. Numerous lecture series bring distinguished individuals to campus throughout the year. The Blue and White Series brings leading concert artists to Durham, and the Allied Arts Series provides a varied program of drama, music, and dance. A student film society sponsors a program of classic films throughout the year. There is also a student FM radio station, and frequent student recitals and plays.

The University Library has music listening rooms for students and a collection of 2,800 records.

## Admissions Procedure

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University admissions policy is designed to provide for the admission of those students whose personal record, achievement, aptitude, and motivation demonstrate that they have the qualifications for carrying the desired program satisfactorily.

The University admits in-state residents who have a scholastic record which ranks them in the upper two-fifths of their graduating classes from accredited or approved secondary schools, provided they are recommended or certified, and have an appropriate college preparatory background.

All candidates for admission to the University are required to submit the results of the College Entrance Examination Board Scholastic Aptitude Tests and the English Composition Achievement Test taken during the senior year. Achievement Tests in a language are required for all students entering the Whittemore School of Business and Economics and the College of Liberal Arts. Other Achievement Tests, though not required, are strongly recommended for applicants to the College of Agriculture and the College of Technology in an area or areas generally related to the student's prospective major, e.g., Level I Mathematics Test for engineering.

Interviews are not required as part of the admission process. They may, however, be requested by the Admissions Office if deemed necessary or desirable to make an equitable decision. Group information sessions by appointment are frequently held on Saturday mornings. These group sessions are essentially opportunities for information exchange and are followed by guided tours of the campus. Applicants are encouraged to visit the campus in any event, and regularly scheduled tours leave the Memorial Union at 2:00 p.m. Saturday and Sunday when college is in session.

The number of out-of-state students admitted each year is limited and selection is made primarily on the basis of superior academic achievement in secondary school. Such traits as good character, leadership, initiative, and creative ability are considered.

All applicants living in New Hampshire are required to submit a notarized statement to the effect that their parents are legally domiciled in the state. Students admitted from states other than New Hampshire or from foreign countries are considered as non-resident throughout their entire attendance at the University unless their parents have gained bona fide residence in New Hampshire.

Except for early decision candidates, applications should be submitted only after the first term grades are available and for non-resident applicants before February 15.

No New Hampshire applicant can be considered whose application is not complete at least by May 1. Thereafter, he may be considered only as vacancies occur. A non-refundable application fee — \$10.00 for resi-

## General Information

dents of New Hampshire and \$15.00 for non-residents — must accompany the application.

The University recommends the following secondary academic program for students applying to the several undergraduate colleges.

	<i>Agriculture</i>	<i>Liberal Arts</i>	<i>Technology</i>	<i>Whittemore</i>
English	4 units	4 units	4 units	4 units
Language	2 units	3 units*	3 units	3 units
Mathematics	3 units†	3 units	4 units†	3 units
Laboratory				
Science‡	3 units	3 units	3 units§	3 units
Social Studies	3 units	3 units	2 units	3 units

The University will consider applicants who have taken less than the recommended programs with the following minimums:

	<i>Agriculture</i>	<i>Liberal Arts</i>	<i>Technology</i>	<i>Whittemore</i>
English	4 units	4 units	4 units	4 units
Language	0 units	2 units*	0 units	2 units*
Mathematics	2 units	2 units	3½ units†	2 units
Laboratory				
Science‡	1 unit	1 unit	2 units§	1 unit
Social Studies	2 units	2 units	2 units	2 units

Applicants might well include courses or other experiences in music, art, and drama in their secondary school programs in addition to more formal academic preparation.

The University participates in the Regional Cooperation Program of the New England Board of Higher Education in which students from other New England states are given priority in certain curricula, as well as special tuition consideration. Information may be obtained from the New England Board of Higher Education, 31 Church Street, Winchester, Massachusetts, or from the admissions offices of the New England state universities.

## Early Decision

The University is willing to give applicants an indication of admission, based on scholastic attainment for three years, under an early decision procedure. This plan is specifically appropriate for a well-qualified student

\* Of a single foreign language.

† Including algebra I and II, plane geometry, and trigonometry.

‡ Excluding "General Science."

§ Must include Physics and Chemistry.

who has made the University his first choice and who submits a regular application including junior SAT's with a statement countersigned by the secondary school that UNH is his first choice college and that other applications will be withdrawn if he is admitted under early decision.

### Early Admission

Secondary school students who show unusual promise may be admitted early to the University. While it does not actively recruit candidates for college entry before graduation from secondary school, the University will, upon recommendation of the school, review the credentials of those whose academic programs have been unusually successful and extensive. Social and emotional maturity also are considered in selecting candidates for early admission.

### Advanced Standing

The University will recognize unusual secondary school work by means of advanced placement and credit for those who have taken especially enriched or accelerated courses before entering college. Applicants qualify for such credit by satisfactory achievement on University-approved placement examinations including the College Board Advanced Placement Tests. Further information may be obtained from the Admissions Office.

### Transfer Students

Qualified candidates for advanced standing from approved institutions may be admitted. Their status is tentatively determined by the quantity and quality of the work completed at the institution from which they come. In transfer, credits are allowable for courses which are appropriate to the curriculum for which the student is admitted and for courses in which grades above the lowest passing grade were received.

While the University is pleased to encourage the competent transfer applicant who has valid and legitimate reasons for desiring the transfer to New Hampshire, it cannot encourage the applicant with a history of academic or personal difficulty. University admissions policy restricts consideration for transfer to those students with satisfactory academic, as well as personal, records. In the event of personal or academic difficulty, a student is usually better advised to return to his former college after an appropriate period and clear his record before attempting to transfer.

Students desiring to transfer for the fall semester must complete application procedures before May 1. Since their records call for careful and thorough evaluation, transfer students may experience more delays than other students, with the result that mid-year transfer is often difficult or impossible. Prospective mid-year transfer students are generally better advised to enter at the beginning of the next academic year. In any event, mid-year applications must be filed prior to December 1.



# Fees and Expenses

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The cost for the freshman year at the University averages about \$1,775 for a resident of New Hampshire and \$2,670 for a non-resident.

630.00 Tuition is ~~\$180~~ (\$1,375 for non-residents). As part of the regional co-operation program of the New England Board of Higher Education, some non-residents from certain states will be eligible for tuition at the resident rate in selected curricula. The student must apply to the Registrar for this reduced tuition. Any student registering for eight credits or more per semester pays the full tuition. Any student registering for fewer than eight credits pays \$22.50 per credit hour, plus a registration fee of \$15 for residents and \$50 for non-residents per semester. The minimum fee for any recorded course is \$22.50.

All students who are admitted to the University must make an advance deposit of \$50 for residents and \$100 for non-residents. This deposit will be credited on the student's tuition bill. In case a student decides not to attend the University after making this deposit, it will automatically be forfeited.

Tuition for each semester is payable in advance. Three-fourths will be refunded to a student withdrawing during the first four days of a semester; one-half after four days and within thirty; and none thereafter.

Refundable deposits may be required to cover locker keys or loss or breakage in certain departments. A charge will be made for individual lessons in music, as noted in the description of Applied Music courses. A charge will be made for riding lessons, as noted in the sections on Physical Education for Women and Animal Science.

Books and classroom supplies cost approximately \$125. These may be purchased at the University Bookstore.

There is a Memorial Union assessment of \$12, a recreational physical education fee of \$30, and a student activity tax of \$14.10, which includes a subscription to the undergraduate newspaper and yearbook, and membership in Student Union, Student Government, and class activities. An athletic admissions fee of \$10 is optional.

Personal expenses average \$325. These will vary with the needs of the individual student, and include clothing, laundry, recreation, incidentals, and travel.

The University reserves the right to adjust charges for such items as tuition, board, and room rent from time to time. Such changes will be announced as far in advance as feasible.

A deferred payment plan allows a student to pay one-third of his college bills before registration and one-third at the end of each of the following two months. A \$5 fee is charged for this service, and arrangements are made through the Business Office.



## Dining Services

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Board is \$440. All freshmen, sophomores, and juniors residing in University housing units (not including fraternities and sororities) are required to board in University dining halls. This plan provides students with the least expensive means of eating three well-balanced meals a day, which is a safeguard to the students' health.

Students whose religion or health requires them to observe certain dietary restrictions should be aware that the Department of Dining Services cannot wholly meet this need. However, as much as possible, menus are planned to provide alternatives at each meal which generally give most students with dietary problems considerable choice. Any exceptions to board because of strict dietary restrictions should be made prior to the opening of the college year.

Seniors, graduate students, and those not in residence may purchase semester meal tickets if they so wish or they may obtain meals on an a la carte plan at the Memorial Union Cafeteria.

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## University Housing

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Room rents average \$340. The University has thirteen residence halls for women and eight for men. Undergraduate women are required to live in a residence hall or sorority house unless they live at home. Undergraduate men are not required to live in residence halls, but will be accommodated to the extent of the space available. Room rents range from \$276 to \$460.

Students living in University residence halls are required to sign room contracts covering the entire year beginning in September and ending in June. Housing applications will be sent to the student at the time of official admittance to the University.

Assignments to University residence halls are made during July and August. A notice of room assignment and bill will be sent when assignment is complete. In the event of a late assignment, the deadline payment date for room rent will be extended as indicated on the Notice of Room Assignment and Bill. Failure to pay rent within the specified time will automatically cancel room reservation. No follow-up notice will be sent.

Room rent is payable in advance. For those attending the first semester, one-half of the year's rent must be paid not later than July 15. Rent for those attending the second semester must be paid not later than January 15.

A separate check payable to the University of New Hampshire should be forwarded to the Housing Office for room rent.

Rooms paid for and not occupied one day after registration day may be declared vacant and three-fourths of the room rent returned, unless the

## General Information

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individual having the reservation makes a written request to the Director of University Housing to hold the room until a later date. No room will be held for longer than 10 days after registration date.

An undergraduate woman student under 21 years of age is required to room in one of the women's residence halls or a sorority house, unless she is working for a room in a home approved by the Dean of Students or living with her family.

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## Financial Aid

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A financial aids program assists able and promising students who are unable to meet their educational expenses entirely from their own or their family's resources.

### Grants and Scholarships

A full-time student who is a resident of New Hampshire is eligible for consideration for an in-state *Tuition Grant*. The amount varies from \$100 to full tuition, and the basic consideration is financial need. Non residents are eligible to be considered for non-resident tuition grants; scholastic attainment, financial need, and participation in extra-curricula activities are the principal considerations. The University participates in the Federal Educational Opportunity Grant Program designed to assist students of exceptional need.

There are other scholarships available for both resident and non-resident students. The basis of these awards may be either scholastic attainment, participation in extra-curricular activities, or meeting requirements specified by the donor.

An incoming student should apply for grants and scholarships as early as possible, and not later than February 15. No awards are made until a student has been admitted to the University, has submitted an application for a grant or scholarship, and his parents have filed a parents' confidential statement with the College Scholarship Service at Princeton, N. J. In-state students may obtain these forms from high school principals or guidance counselors. Out-of-state and transfer students may secure the application form from the Financial Aids Office, UNH, and the parents' confidential statement from high school principals or guidance counselors. Applications are due February 15.

*Granite State Merit Scholarships* are awarded to 20 outstanding resident students who are graduates of New Hampshire high schools. Recipients are recommended by high school principals, and are usually the highest ranking students planning to attend the University. The award is \$100 each year providing a 3.0 (B) average is maintained.

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The University sponsors two *National Merit Finalists*, one resident and one non-resident, who have indicated UNH as the college of their choice. The awards vary from \$250 to \$1,500 (\$1,700 for a non-resident) depending on the student's financial need.

Two *Achievement Scholarships* are awarded, one to a resident and one to a non-resident student. Awards are based on high achievement plus high aptitude or special talent recognized by appropriate state or regional groups. Awards vary from \$500 to \$1,200 (\$1,700 for a non-resident) depending on financial need.

The *Valentine Smith Scholarship* of \$100 a year is awarded to the incoming freshman who is judged to have the most thorough preparation for admission to UNH. The results of the College Entrance Examination Board examinations are used in making the selection.

### Loans

Three loan funds are administered by the University: the UNH, the National Defense, and Nursing Student Loans. Financial need must be clearly demonstrated and loans may be used only for expenses incurred in pursuing a college education. Applications may be secured from the Financial Aids Office and should be filed by July 15.

In many communities scholarships and loans are available locally. School principals and guidance counselors have information about these sources of assistance.

### Employment

Part-time employment is usually available for all students wishing to work.

University of New Hampshire participates in the College Work-Study Program, Part C, Title I of the Economic Opportunity Act. The purpose of the program is to help students from low income families in meeting the cost of a college education and those determined by the institution to be in need of financial aid to complete their college education. Freshmen and transfer students are not encouraged to work in the first semester.

For information on the College Work-Study Program and other financial assistance, contact the Financial Aids Office, Thompson Hall.



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**The Colleges**

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# University Academic Requirements

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In addition to the particular requirements for specific degrees established by the Colleges, the University requires that every candidate for a bachelor's degree must successfully complete English 401-402 and History 401, 402; and one year of work (6 semester hours) in each of the following groups:

## Group B (Natural Sciences)

Biology 401, 402, 405  
Botany 411  
Chemistry 401-402, 403-404  
Geology 401-402  
Mathematics 407-408  
Physical Science 401-402  
Physics 401-402  
Zoology 412

= 6 hrs

## Group C (Social Sciences)

Economics 401-402  
Geography 401, 402  
Government 405, 406, 408  
Psychology 401-402  
Sociology 400, 411, 540

= 6 hrs

## Group D (Humanities)

Arts 475, 476  
English 513, 514, 515, 516  
Humanities 501-502  
Music 403, 404  
Language 501, 502  
Any specific foreign language, 503-504, 505-506  
German 501-502 or 605-606  
Russian 501-502 or 605-606  
Philosophy, any courses  
Speech and Drama 431, 436

= 6 hrs

All men students must complete Men's Physical Education 431-432; and all women students, Women's Physical Education 401, 402; 403, 404.

A student shall be considered as having satisfied the group requirement for any group in which he has received advanced placement standing with credit.

A student who has accumulated 30 or more credits in three or more areas in the field of a given group shall be considered as having satisfied the group requirement.



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# College of Agriculture

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**HARRY A. KEENER,**

*Dean*

**M. C. RICHARDS,**

*Associate Dean*

## **Departments**

Animal Sciences

Biochemistry

Botany

Entomology

Forest Resources

Home Economics

Plant Science

Resource Economics

Soil and Water Science

## **Degrees, Majors and Specializations**

**BACHELOR OF SCIENCE:**

Agricultural Education

Animal Sciences

Animal Science

Dairy Science

Poultry Science

Pre-Veterinary Medicine

Biochemistry

Botany

Entomology

General Studies

Plant Science

Resource Economics

Soil and Water Science

Agricultural Engineering\*

Hydrology

Mechanized Agriculture

Soil Science

Wildlife Management

**BACHELOR OF SCIENCE IN FORESTRY:**

Forestry

**BACHELOR OF SCIENCE**

**IN HOME ECONOMICS:**

Family Life Education

Business and Community Services

\* First Two Years at the University of New Hampshire. Second Two Years at the University of Maine.

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## General Information

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### Purpose and Programs

The objectives of the College of Agriculture are to give the student a fundamental education in the biological, physical, and social sciences and to introduce him to the arts and humanities. In addition specific technical courses are provided in the student's interests and in his major.

The College offers three undergraduate degrees: the Bachelor of Science in Agriculture, the Bachelor of Science in Forestry, and the Bachelor of Science in Home Economics.

### Advisory System

A member of the faculty closely related to the student's area of interest is appointed as an adviser to assist the student in planning his academic program.

The student may select his major upon entering the College or he may wait until registration for the sophomore year.

### More than One Undergraduate Degree

A student may obtain more than one undergraduate degree at the University by completing all the curriculum, departmental, scholastic, and other requirements for each degree. Students desiring to earn more than one undergraduate degree should make their plans known to their adviser and the College Deans concerned early in their college careers.

### Honors Program

The College of Agriculture, through its various departments, offers the superior student the opportunity to participate in an Honors Program which is individually designed to provide added intellectual incentives and opportunities. Participation in the Honors Program is by invitation of a faculty member with the approval of the department concerned and the Dean of the College. It is limited to those students entering the sophomore or junior year with at least a 3.0 grade point average. The recommending faculty member, his department Chairman, and the Dean will constitute the student's academic advisory committee. This committee and the student will decide upon a suitable academic program. Departmental and College course requirements may be waived for students in the program. The student will complete the same number of credits to graduate as other students in the department.

## Bachelor of Science

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Many professional careers are open for our graduates. There are opportunities for people trained in resource development and conservation in rural areas in addition to positions for serving in agricultural industries. Newly created countries throughout the world are asking for assistance in all phases of agriculture, including home economics and forestry.

In all departments students may prepare for further graduate work in their respective fields of interest.

Following are additional examples of employment agencies and industries and the careers which they offer:

The agricultural industries, dairy, poultry, and general farming, state and federal governments, feed and fertilizer manufacturers, food processors, cooperatives, banks, and marketing and transportation industries employ graduates as price analysts, farm appraisers and managers, poultry specialists, and in dairy and livestock occupations as farmers, managers, and technologists.

State planning and recreation agencies, soil conservation services, the cooperative extension services, and private research firms employ rural and urban planners, hydrologists, conservation experts, resource development economists, nurserymen, and landscape gardeners.

The Peace Corps, the Foreign Agricultural Service, the Food and Agricultural Organization of the United Nations, and U. S. export and import firms hire economic growth and farm production experts, soil and water managers, market analysts, international trade economists, agricultural engineers, teachers, plant and animal breeders, and nutrition specialists.

The Federal Government and state agencies, universities, health services, and private foundations employ biochemists, geneticists, animal nutrition specialists, plant and animal pathologists and physiologists, veterinarians, foresters, home economists, and entomologists.

### Academic Requirements

For the Bachelor of Science degree a total of 128 credits are required. In addition the student must complete the University academic requirements found on page 73 and obtain a written recommendation for graduation from his adviser and department chairman.

### Agricultural Education Major

The Agricultural Education curriculum provides for both a basic and liberal college preparation for those students who plan to teach agriculture or seek employment with the Cooperative Extension Service as agricultural or 4-H club agents. Graduates also find employment in specialized positions with industry or in education where a broad background of technical and

professional skills is needed for sales, promotional, administrative, or research activities.

Students in this curriculum satisfy state teacher certification requirements or the Extension Service preparation recommendations by one semester of off-campus experience in a student training center and or in a county Cooperative Extension Service office.

Students desiring to major in this curriculum should consult the professor in charge before the end of the sophomore year.

Students in other majors or areas of specialization who wish to minor in Agricultural or Cooperative Extension Education should consult their advisers and the professor in charge early in their academic careers.

### Animal Sciences

The Animal Sciences courses are offered to provide students fundamental scientific training in such specialized areas as genetics, nutrition, animal hygiene, processing, and management. The student also has an opportunity to further concentrate his studies in the fields of Animal, Dairy, or Poultry Science, or Pre-Veterinary Medicine.

Outstanding graduates are qualified to pursue advanced study in preparation for college teaching, research and responsible technical positions in industry and federal and state agencies. Students interested in production and processing can receive training as production managers, for positions in the feed or equipment industries, marketing organizations, breeding associations, sales and service work in allied industries and other areas of the diversified animal agricultural industry.

The department maintains Morgan horses for all phases of class work including riding. Herds of Milking Shorthorn, Hereford and Angus cattle, and Yorkshire swine and a flock of Dorset sheep are maintained.

The nationally recognized dairy herd, consisting of registered Ayrshire, Guernsey, Holstein, and Jersey animals, is housed in a new dairy barn. The Ritzman Animal Nutrition Laboratory includes bomb calorimeters, metabolism stalls for digestion studies, respiration chambers for heat production measurements, and other facilities used in nutrition teaching and research with both farm and laboratory animals.

The University Poultry Farm facilities are available for instruction and for research and include laboratories for both teaching and research in poultry genetics, nutrition, and management.

Laboratory facilities, including such modern equipment as ultra centrifuge, amino acid analyzer, and gas chromatograph, are available in Nesmith Hall, to provide the latest scientific training in the field of animal hygiene.

The Department works closely with the New Hampshire animal industry and frequent class trips are made to leading farms, industrial concerns, processing plants, etc., where opportunities are presented for viewing industry in action.

Students who contemplate veterinary medicine as a career should confer early with the adviser to Pre-Veterinary Medicine students. Although two years of pre-veterinary college work will meet the requirements of most schools of veterinary medicine, it should be noted that all veterinary colleges give first preference for admission to applicants from their respective states. Out-of-state students who are admitted must show above average scholastic ability. It is desirable that applicants to colleges of veterinary medicine have farm experience, and, in fact, it is a prerequisite for admission to some.

### Biochemistry

Biochemistry is the study of the chemistry of living things and of life processes. A student majoring in Biochemistry will receive a fundamental training in chemistry, including courses in general, analytical, organic, and physical chemistry. An equally broad program in biological sciences is recommended. In addition to training in Biochemistry, including an opportunity to participate in basic research during the senior year, students may select courses in botany, zoology, microbiology, and genetics.

The curriculum is designed to provide a strong foundation either for technical positions in universities, experiment stations, research institutes, and industrial or government laboratories or for graduate study in the natural sciences or in medicine. Excellent opportunities for teaching and research in Biochemistry are available to students who earn graduate degrees in this very rapidly growing field of science.

A student who wishes to major in this department should register for Chemistry 405-406 and for Mathematics 425-426 in the freshman year. Students having an interest in Biochemistry are advised to consult with Professor Edward J. Herbst, Chairman of the Department.

### Botany

Students seeking a broad background in the plant sciences should consider majoring in Botany. The department offers a wide range of courses in the following areas: (1) Plant Pathology, the study of plant diseases, their causes and control; (2) Plant Physiology, the study of plant functioning with such practical applications as plant nutrition and requirements for plant growth; (3) Taxonomy, plant classification and plant identification; (4) Ecology, the relationship of the plant to its environment; (5) Morphology and Anatomy, the study of the anatomy, development, and cellular organization of plants, including histological techniques; (6) Cytology, the structure, physiology and development of cells; (7) Phycology, the study of algae, their morphology, life history, classification and ecology; and (8) Preparation for secondary-school teaching.

The course program for freshman and sophomore Botany majors is designed to acquaint them with the basic material in the field; specialization,



usually begins in the junior year.

Students who graduate in Botany frequently pursue graduate work in Botany. Assistantships, research positions, and full-time teaching jobs are widely available. Opportunities for able botanists also exist in government work. Positions as technicians or secondary-school teachers may be obtained with a B.A. or B.S. degree.

### Entomology

Entomology offers courses for students who wish to specialize in the study of insect life, insect control, and insects in relation to man. There are many positions open to those qualified in Entomology. There are opportunities for employment in public institutions and with commercial and industrial firms.

Students are given a fundamental training in Entomology and related fields. Those who wish to specialize in the chemical control of insects, and who plan to take graduate work leading to a professional degree, will follow a program outlined as Insect Toxicology. These students will be expected to take advanced courses in mathematics and chemistry.

Students planning a career in Entomology may select elective courses best suited to their needs and interests.

### General Studies

This curriculum is offered for the student who wishes to secure a broad non-specialized background in several areas of the College or University without specializing in any particular department. After completing the University course requirements the student may select courses to fit his specialized or general interests. A student transferring from one major to another may wish to register in the General Studies curriculum until his educational objectives have been more clearly defined or a student may complete his work for the B.S. degree in the General Studies curriculum.

### Plant Science

Students with an interest in economically important plants and their use for food, feed, fiber, recreation, or ornamental purposes should consider specialization in Plant Science. Because of the diversity of employment possibilities, the Plant Science curriculum is flexible. Students first obtain a basic knowledge of physical and biological sciences. Selected courses then relate these sciences to the individual's interest. Three options are available as informal guides for curriculum development — science, management, and agribusiness. In addition, the student may wish to concentrate his attention toward either horticultural or agronomic crops.

The science option should be followed by students preparing for advanced study. Additional course work in chemistry, physics, and mathematics will provide an excellent foundation upon which the student can

build his research or teaching career.

Management encompasses production and marketing of farm or ornamental crops and establishment and maintenance of turfgrass or nursery stock. Within this area, students will find opportunities in management of farms, greenhouses, golf courses, or nurseries, on state park or highway planning commissions, and with food and feed processing firms. Students specializing in management will select production and applied courses to support the basic core of study.

Agribusiness will expose the student to more courses in marketing, economics, accounting, and business procedures while still retaining the fundamental requirements in Plant Science. Specialization in this area will prepare students for sales and brokerage positions in wholesale or retail marketing or for positions in industry.

Plant Science is a curriculum for city as well as farm men and women. Departmental programs are often conducted in cooperation with New Hampshire plant industries. This cooperation offers the student an opportunity to associate scientific principles with industry practice, thereby extending the scope of his training.

Students interested in a Plant Science major may consult with the Department Chairman, Professor L. C. Peirce.

### Resource Economics

This department offers courses in the following subject matter areas: Resource Economics, including public resource policy, resource management, conservation economics, and regional economics; and Agricultural Economics, including farm management, food marketing and consumption, agricultural price policy, and world food supplies.

The student in Resource Economics is trained primarily in the science of economics and its use in problem solving by individuals, households, business firms, and administrators of governmental agencies. In addition, the student is encouraged to take courses which will lead to a broad university education. Majors concerned with the conservation and use of natural resources should take courses in the departments of Forest Resources, Soil and Water Science, and Geography. Those majors who are interested in the economic or business aspects of agriculture will be expected to take courses in the departments of Animal Sciences and Plant Science. All majors in Resource Economics will be expected to take some selective courses in the Whittemore School of Business and Economics.

Many students majoring in the various social science and agricultural departments of the University have found it to their advantage to elect some courses in Resource Economics. In this manner their basic training can be supplemented in a specific area of interest, such as farm management and agricultural marketing for agricultural majors and resource development, consumer economics and natural resource policy for social sci-



ence majors.

Students who major in the department of Resource Economics are qualified for a wide variety of opportunities upon graduation. There is presently a strong demand by private business, public institutions, and government agencies for specialists trained in agricultural, fisheries, and forestry marketing; conservation, resource development, and land use policy; agricultural extension, resident teaching; and for farm managers.

In many cases the student may wish to further his education and improve his qualifications by pursuing more specialized graduate studies in one or more of the above areas. The Resource Economics department offers a Master's degree to meet these needs and in addition, has been very successful in placing its own Bachelor degree recipients in other graduate schools.

### Soil and Water Science

The subject matter of this program may be classed in both the biological and earth sciences. It includes knowledge of the outermost layer of the earth's crust and that portion of the hydrologic cycle pertaining to the fate of water falling on the earth's surface. Knowledge concerning soil and water is important to persons working in the plant sciences, geology, geography, meteorology, and certain aspects of engineering. Students interested in Soil and Water Science may select one of the four majors described below or develop a program combining elements of the four.

**SOIL SCIENCE:** This includes the study of chemical and physical properties of soils in relation to their formation, classification, absorptive capacities for chemical elements and compounds, engineering properties, and ability to support microorganisms and higher forms of plant and animal life. Students obtain a basic knowledge in the physical and biological sciences to prepare for graduate study, for employment by commercial enterprises, or work for various state and federal agencies. Those who continue their education and obtain advanced degrees find professional positions available in teaching and research.

Based upon experiences of alumni, employment opportunities are found in college teaching, research at universities, with chemical companies, the U. S. Department of Agriculture, soil survey and soil conservation, as Extension specialists and in county agent work, land appraisal, forestry, and foreign service, such as technical assistance programs and the Peace Corps.

**HYDROLOGY:** This is the science underlying development and control of water resources on and beneath the earth's surface. Sciences closely related and basic to the analysis and understanding of water in the hydrologic cycle are meteorology, soils, geology, plant physiology, physics, and chemistry. Because water is a basic requirement of life, it has social, economic, and political significance throughout the world. As the population of the

## College of Agriculture

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world grows and as industrial, recreational, agricultural, and residential needs for water increase, greater emphasis will be placed on the study and understanding of problems associated with water resources. Employment opportunities for those broadly trained in hydrology will continue to expand.

Persons trained in hydrology are qualified to seek employment with the United States' Bureau of Reclamation, Geological Survey, Corps of Engineers, and Soil Conservation Service; public utility companies, federal and state forestry services, state highway departments, recreation groups, community resource planning boards, international organizations, scientific or educational institutions, or for self-employment.

**MECHANIZED AGRICULTURE:** This major is designed to provide instruction and training in the fundamentals of agricultural science with particular emphasis on the technical phases. The program of study prepares graduates for self-employment and for commercial positions in the agricultural industry.

Mechanized Agriculture majors may find employment selling or servicing agricultural building materials, labor-saving mechanical equipment, irrigation systems, tractor, and field machinery. Graduates are qualified for positions as agricultural extension workers, as soil conservationists, or as rural use advisers with electric utility companies. They may also find employment with farm insurance companies or agricultural management organizations.

As farming becomes more intensive and the mechanization of our farms more complete, there will be even greater opportunities for graduates with this type of training.

**AGRICULTURAL ENGINEERING, COOPERATIVE PROGRAM:** A major in Agricultural Engineering is offered in cooperation with the Department of Agricultural Engineering at the University of Maine. This is an accredited program. A student completes the first two years of course work at the University of New Hampshire and then transfers to the University of Maine to complete the junior and senior requirements to receive a Bachelor of Science degree in Agricultural Engineering.

### Wildlife Management

This curriculum is for students whose interest is in the production, management, and utilization of game and other forms of wildlife. It is designed to provide a knowledge of wildlife species and of the total forest and field environment of which they are a part. It prepares the student for work with public and private agencies in wildlife management, and is a base for graduate study needed for research and teaching assignments.

The degree earned is a Bachelor of Science with a major in Wildlife Management. The program is administered in the Department of Forest

Resources and is a cooperative program with the departments of Animal Sciences, Forest Resources, and Zoology. Inquiries should be addressed to the Department of Forest Resources, Pettee Hall.

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## Bachelor of Science in Forestry

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The primary objectives of this program are to help the student develop as a person and as a professional forester. His courses in Forestry form the foundation through which he will be professionally prepared.

Bachelor of Science degree graduates are employed in all phases of supply, growth, and utilization of raw materials from the forest. Many graduates eventually become specialists in the wildlife, grazing, watershed, and recreational aspects of land management. One-fifth of the population in New Hampshire engaged in manufacturing is employed in forest based industries. Lumber and paper production are among the top ten industries in the United States.

A comprehensive education emphasizing the biological, physical, and social sciences is provided in the undergraduate curriculum to give a sound base for embarking on a professional career or for entering graduate schools to obtain specialization in specific areas of forestry.

Field work is carried out during the academic year on woodlands adjacent to the campus which are managed by the Department of Forest Resources. In June each year a two-week field session is held for all students who have completed their sophomore year of studies. There is no additional summer camp. Forestry majors are assisted and encouraged to obtain summer employment during which time the student's performance and progress receive guidance and appraisal.

In addition to the normal University fees and tuition, Forestry students are required to meet transportation and meal charges in connection with regularly planned field trips and the June field sessions.

The Department of Forest Resources is accredited by the Society of American Foresters, the national accrediting agency for forestry schools.

Information on the undergraduate program leading to a B.S. with a major in Wildlife Management will be found on the preceding page.

### Curriculum

The curriculum on the following page includes the University academic requirements and also the departmental requirements for the B.S. in Forestry degree.

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# College of Agriculture

FRESHMAN YEAR		SEMESTER CREDITS	
Chem. 403, 404	General Chemistry*	4	4
Bot. 411	General Botany	4	
For. Res. 425, 426	Dendrology; Wood Technology	3	4
Math 421, 422	Fundamental Mathematics†	3	3
Zool. 412	Principles of Zoology		4
Engl. 401, 402	Freshman English	3	3
P.E. 431-432	Physical Education	1½	1½
		<hr/>	<hr/>
		17½	18½

SOPHOMORE YEAR		SEMESTER CREDITS	
Hist. 401, 402	Introduction to Contemporary Civilization	3	3
For. Res. 527, 528	Silvics; Applied Statistics	3	3
S. and W. 501	Introductory Soils	4	
For. Res. 544	Forest Economics		4
Botany 751 or	Plant Pathology	3	
Ent. 506	Forest Entomology		3
Math 401	Computer Programming	1	
C.E. 501	Surveying	3	
	Free Elective		3
		<hr/>	<hr/>
		17	16

SPRING FIELD SESSION (JUNE)		SEMESTER CREDITS	
For. Res. 542	Forest Field Surveying	3	
		<hr/>	
		3	

JUNIOR YEAR		SEMESTER CREDITS	
For. Res. 543	Mensuration	4	
For. Res. 629, 660	Silviculture; Forest Protection	3	3
Pol. Sci. 405 or	Elements of Political Science	3	
Pol. Sci. 406	Principles of American Government		
	Business Administration	3	3
	Forestry Science Group‡	4	4
S. and D. 501	Basic Speech		3
		<hr/>	<hr/>
		17	16

\* Chemistry 401, 402 for students without high school chemistry.

† Mathematics 407-408, or Mathematics 425 will also complete the departmental requirement.

‡ Eight credits from the following: physics; biochemistry; genetics; plant physiology; zoology other than 412, 512; intermediate or advanced statistics.

SENIOR YEAR		SEMESTER CREDITS	
Group D	Humanities	3	3
For. Res. 653, 654	Logging Economics; Wood Products	3	3
For. Res. 661, 746	Forest Management	4	4
	Business Administration	3	
	Free Electives	3	6
		16	16

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## Bachelor of Science in Home Economics

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The purpose of the undergraduate program in Home Economics is twofold:

1. To provide, through the facilities of the Department and the total University, a broad liberal education with study in depth in the social sciences or natural sciences;
2. To provide specialized instruction based on these disciplines, as preparation for professional careers in which the interests and well-being of the individual, the consumer, and the family are paramount.

The curriculum within the Department of Home Economics relates basic knowledge to an understanding of the needs of people with regard to food, clothing, shelter, management of resources, and interpersonal and family relationships.

### Programs of Study

A candidate for the degree of Bachelor of Science in Home Economics completes 128 credit hours of required and elective courses, including the University requirements for graduation as listed on page 73 of this catalogue.

During the freshman year a student selects courses from the various groups listed under the University requirements and courses within the Department of Home Economics. In the sophomore year a student selects a concentration in either the social sciences or the natural sciences and by the end of the sophomore year makes a decision regarding the professional major within Home Economics.

## College of Agriculture

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The major areas of study in the Department of Home Economics are:

1. **FAMILY LIFE EDUCATION:** may provide students with qualifications necessary for beginning work in home economics and family life education in secondary schools, cooperative extension, community agencies or pre-school programs. The three options in this major are:

- (a) secondary school teaching
- (b) community and adult programs
- (c) pre-school programs

New Hampshire certification for home economics teachers requires: 18 credits in education (including the courses below marked with an asterisk) and 6 credits (minimum) in each of these areas: the home, the family, food and nutrition, clothing and textiles.

2. **CONSUMER SCIENCE AND FAMILY SERVICE:** may provide students with the qualifications to enter a dietetic internship program or competences for beginning positions in food and nutrition or clothing and textiles in business, home economics cooperative extension or family-community agencies. The two options in this major are:

- (a) food and nutrition
- (b) clothing and textiles

### Family Life Education Curriculum

University Requirements see page 73.	34 credits		
Behavioral Sciences (sociology, psychology) at least 12 credits required in one area. Six credits from University requirement Group C may be included.	21 credits		
Family Life Core One course from each of the following areas: family relations, child development      food, nutrition management, housing      clothing, textiles	12 credits		
Home Economics (in addition to core)	24 credits		
	OPTION A	OPTION B	OPTION C
family relations and child development	9-12 credits	9-12 credits	15 credits
management and housing	6- 9 credits	6- 9 credits	3 credits
other	6 credits	6 credits	6 credits
Professional Methods	15-18 credits		
Suggested courses, selected with adviser:			
* Education 757 — Psychology of Learning			
Education 758 — Principles of Teaching			
* Education 759 — Principles of Education			



## Education 763 — Instructional Media

- \* Home Economics 791 — Methods in Home Economics Education
- Home Economics 792 — Methods in Family Relations Education
- \* Home Economics 794 — Supervised Teaching
- Home Economics 798 — Seminar, Home Economics Education
- Agricultural Education 650 — Agriculture and Extension Education
- Agricultural Education 795 — Adult Education
- Sociology 621-622 — Social Welfare
- Home Economics 548 — Field Work
- Home Economics 628 — Practicum: Pre-school
- Spanish 638 — Language and Speech Development

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Electives	approximately 25 credits
To complete a total of 128 credits	

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## Consumer Science and Family Service Curriculum

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University Requirements	34 credits
see page 73.	

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Social Sciences (economics, sociology, psychology) OR	21 credits
Physical, Biological Sciences (required for dietetic internship)	
Six credits from University requirements may be included	

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Family Life Core	12 credits
One course in each of the following areas:	
child development, family relations	food and nutrition
management, housing	clothing and textiles

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Home Economics (in addition to core)	24 credits
food and nutrition	18 credits
or clothing and textiles	18 credits
home economics electives	6 credits

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Additional Courses to Strengthen Professional Preparation	18 credits
To be planned in consultation with adviser from groups such as:	
business administration	education
communications	art
(journalism, radio and TV, etc.)	
other groups approved by adviser	
nine credits to be selected from at least one of the above groups	

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Electives	approximately 25 credits
To complete a total of 128 credits	

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## College of Agriculture

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Workshops for developing skill in clothing construction and food preparation will be available when needed for a particular professional competency.

The food and nutrition option under the consumer science, family service major with the physical and biological sciences prepares a student for a dietetic internship after graduation.

The above curricula provide sufficient flexibility to permit combinations suited to individual needs. Electives may be used to build strong combinations with other fields of interest such as journalism, business, art, or to explore several areas of interest to broaden the general education background.

A junior or senior student in the department may attend The Merrill-Palmer Institute in Detroit, Michigan, for one semester, with full transfer of credit. The Department of Home Economics is affiliated with The Merrill-Palmer Institute which was founded in 1920. This program is designed to give students a theoretical knowledge and understanding of human development and the family and to provide practicum training for students preparing to work professionally in various capacities with individuals, families, and groups.

These curricula are open to men and women.

A program leading to the Master of Science degree in Home Economics is outlined in the Graduate School catalogue.

## Thompson School of Applied Science

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PHILIP S. BARTON, *Director*

The Thompson School is the two-year division of the College of Agriculture. It offers programs of study on the technician level. High school graduates with satisfactory grades and a real interest in furthering their education are admitted. Two years of academic work on campus, totaling 64 semester credits, plus completion of one summer of supervised placement, lead to the degree of Associate in Applied Science.

The Thompson School offers the following curriculums: Animal Science; Commerce Technician, Food Service Management; Forest Technician, General; Plant Science; Soil, Water and Construction Technician.

Applicants desiring admission in the Forest Technician and Soil, Water, and Construction Technician Curriculums must submit two units in College Preparatory Mathematics. Applicants for admission in the other curriculums will find Biology, Chemistry, and Mathematics helpful prerequisites for courses in the Plant and Animal Sciences. Each prospective applicant must take the College Board Scholastic Aptitude Test during his senior year in high school.

A catalogue may be obtained from the Thompson School of Applied Science, Putnam Hall, University of New Hampshire, Durham, New Hampshire 03824.

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# The College of Liberal Arts

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~~EUGENE B. SACKETT,~~

~~Dean~~

EUGENE S. MILLS,

~~Dean~~

MELVILLE NIELSON,

*Associate Dean*

MRS. CLAIRE WRIGHT,

*Academic Counselor*

## Departments

The Arts

Education

English

French and Italian

Geology and Geography

German and Russian

History

Microbiology

Music

Nursing

Occupational Therapy

Philosophy

Political Science

Psychology

Sociology

Spanish and Classics

Speech and Drama

Zoology

## Cooperating Depts.

COLLEGE OF AGRICULTURE:

Botany

Entomology

COLLEGE OF TECHNOLOGY:

Chemistry

Mathematics

Physics

DIVISION OF PHYSICAL EDUCATION  
AND ATHLETICS:

Physical Education for Men

Physical Education for Women

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## Programs of Study

### BACHELOR OF ARTS:

#### The Arts

Painting and Graphics

Crafts

History of Art

Biology

Botany

Chemistry

Chemistry and Physics

Earth Science

Elementary Education

English Literature

English Teaching

Entomology

French

General Physical Science

Geography

Geology

German

History

Latin

Mathematics

Microbiology

Music

Music History

Applied Music

Music Theory

Philosophy

Physics

Political Science

International Relations

Psychology

Sociology

Spanish

Speech and Drama

General Speech

Drama

Speech and Hearing Therapy

Zoology

### BACHELOR OF SCIENCE:

Art Education

Medical Technology

Music Education

Nursing

Occupational Therapy

Physical Education for Men

Physical Education for Women

Recreation and Parks

Social Service

### BACHELOR OF MUSIC:

Piano

Organ

Voice

Strings, Woodwind, Brass or

Percussion

Theory

### SUPPLEMENTAL NON MAJOR

#### PROGRAMS:

Pre-Dental

Pre-Medical

Pre-Law

University Teacher Preparation

Program

## General Information

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### Purpose and Objectives

It is the purpose of the College of Liberal Arts, as a center of learning and scholarship, to help all of its members achieve an understanding of the heritage of civilization and to educate them in the tradition of the past and the realities of the present so that they may recognize and act upon their obligations to the future.

The College endeavors to meet the educational needs of each student through the development of interests and skills which, combined with the student's potential, makes possible the living of a richer and more useful life.

### Programs of Study

The College of Liberal Arts offers three degrees: Bachelor of Arts, Bachelor of Science, and Bachelor of Music.

The *Bachelor of Arts Program* is intended primarily to provide a broad liberal education along with a major in one of the fields listed above. Requirements for the Bachelor of Arts degree, and information regarding these majors, are presented in the section entitled *Bachelor of Arts Program*.

The *Bachelor of Science Curricula* consist of several programs of study which are intended to provide preparation for professional life. They are arranged in such a manner as to permit considerable specialization while providing a broad cultural education for the students enrolled in them. Bachelor of Science Curricula are offered in the fields listed above. Requirements for the Bachelor of Science degree, and information regarding these curricula, are presented in the section entitled *Bachelor of Science Curricula*.

The *Bachelor of Music Curriculum* is designed to provide professional training in applied music and in musical theory, and to allow students to develop their talent to the equivalent standard of that offered by conservatories of music. Requirements for the Bachelor of Music Curriculum, and information regarding this curriculum, are presented in the section entitled *Bachelor of Music Curriculum*.

Although the University will try to provide sufficient facilities so that a student may pursue any major or curriculum for which he meets the requirements, such a privilege cannot be guaranteed. Rapidly increasing enrollment sometimes results in crowding required specialized courses beyond capacity. On occasion, a student may remain in a crowded curriculum if he is willing to take certain courses during the summer session.

## Minor Option

Each student in the College of Liberal Arts may apply during his final term for a minor, to be shown on his transcript. A student should declare his intent to earn a minor as early as possible but no later than the end of his junior year. The minor may be in any discipline in the College of Liberal Arts or any discipline in which a student may earn a Bachelor of Arts degree. A minor is 18 semester hours with C or better in subjects that count for major credit or other courses approved by the minor department. No more than six credits used to satisfy major curriculum requirements shall be used for a minor.

## Supplementary Programs of Study

Although pursuing his studies in the College of Liberal Arts in one of the listed major fields, the student may also prepare himself for some related objectives. Two of these are described below, and there is enough freedom of election to make it possible for the student to arrange others.

### PRE-MEDICAL AND PRE-DENTAL

Students who plan to enter a school of medicine or dentistry may elect to major in almost any field offered under the Bachelor of Arts Program, but will, of course, need to include all courses specifically required for admission to the professional school. The Faculty of the College has established a Pre-Medical Advisory Committee to handle the advisement of students and to formulate recommendations to colleges of dentistry and medicine. Students who have a real interest in either dentistry or medicine should contact Professor Paul E. Schaefer, Spaulding 207, early in the freshman year or as soon as a decision is reached to pursue a professional career. The office of the Pre-Medical Advisory Committee keeps a file of information on the requirements of all medical and dental colleges of the United States and Canada, plus other pertinent information concerning admission to such schools. Today most colleges of medicine *require* the Medical College Aptitude Test and a composite recommendation. Information and application forms for the MCAT and the Dental Aptitude Test are available in the office of the Committee. In order to assure adequate information for the composite recommendation, all students who plan to apply to a medical or dental college must register with the Pre-Medical Advisory Office *no later than* the first semester of the sophomore year.

### PRE-LAW

While the various bar associations and law schools do not prescribe a specific undergraduate curriculum for future lawyers, they recommend that a student who contemplates entering law school should plan a study program which will develop breadth of view and facility of expression. They also urge him to acquire a background of information concerning the so-

ciety in which he lives and the forces which have shaped modern institutions. They urge him particularly to perfect his use and understanding of the English language in writing and speaking.

The courses considered most helpful are those which develop oral and written expression, deal with man's social, economic, and political institutions, provide an understanding of the human mind, and develop the art of thinking. A course in the elements of accounting may be useful.

Most law schools require the Law School Admission Test of students seeking admission; each law school will advise a student upon request whether or not he will be expected to take the test in partial satisfaction of admission requirements. Particulars of the examination may be obtained at the office of the Department of Political Science.

Students who plan to enter law school after graduation are advised to consult with the Chairman of the Department of Political Science as soon as they have made their decision, preferably in the sophomore year.

### Preparation for Teaching

The University of New Hampshire offers two types of undergraduate programs for secondary school teacher preparation and one undergraduate program for elementary school teacher preparation.

All of the teacher education programs are selective. For details about the standards of selection, see the prerequisites for the courses in Education.

#### SECONDARY SCHOOL TEACHER EDUCATION

**UNIVERSITY TEACHER PREPARATION PROGRAM.** *Bachelor of Arts Program* students preparing to teach in secondary schools may follow an advisory program of studies called the University Teacher Preparation program. A student in this program will take Education 481 in the sophomore year, Education 757 and 758 in the junior year, Education 759 and the Education 791 course in the major teaching field in the first semester of the senior year. Student teaching is done during the second semester of the senior year. Variations in this sequence are possible if circumstances make it desirable.

Students following this program do not major in the Department of Education. They major in the subject-matter department and elect the courses in this program. Students interested in this program should consult with the Supervisor of the subject-matter major and with Professor Roland B. Kimball, Chairman of the Department of Education or a member of the Department faculty.

**BACHELOR OF SCIENCE CURRICULA IN TEACHER EDUCATION.** There are curricula for preparing teachers in the fields of Agriculture, Art, Home Economics, Music, and Physical Education. The curricula in Agriculture Educa-



tion and Home Economics Education are described in the College of Agriculture section; the curricula in Art Education, Music Education, and Physical Education are described under *Bachelor of Science Curricula*.

Students interested in one of these programs should consult with the Supervisor of the curriculum.

### ELEMENTARY SCHOOL TEACHER EDUCATION

Students planning to teach in elementary schools will declare Elementary Education as their major. Information about this major is presented in the section entitled Bachelor of Arts Program.

### COURSES IN SUPERVISED TEACHING

The work in Supervised Teaching is under the joint direction of the Coordinators of Student Teaching who are the faculty members for the special methods courses offered by the various subject matter departments, the Director of Student Teaching and other members of the faculty of the Department of Education. Student teaching is done under the immediate supervision of selected teachers in schools approved by the University.

In the Supervised Teaching courses the student participates in the conduct of class instruction and in the control of the classroom, at first chiefly as an observer, but gradually entering into teacher responsibilities until complete charge of the classroom is assumed.

A course in Supervised Teaching is required in the University Teacher Preparation Program. It is open only to students approved by the Department of Education and the Coordinators of Student Teaching for the subject or subjects which the student desires to teach. *Applications for first semester student teaching assignment must be filed in the office of Department of Education during the week prior to April 10 of the preceding academic year.* Those for second semester student teaching must be filed during the week prior to November 10 of the preceding semester.

To be eligible for student teaching the student must have completed the prerequisite sequences of courses in the appropriate Curriculum in Teacher Education or must have completed the sequence of Education courses in the University Teacher Preparation Program and an appropriate sequence of courses in the subject matter department concerned. In addition, the student must have an overall grade point average of 2.2, a grade point average of 2.5 in the subjects or fields he will student teach, and a grade point average of 2.5 for all professional education courses taken.

### ACCREDITATION AND CERTIFICATION

The teacher preparation programs of the University are accredited by the National Council for Accreditation of Teacher Education for the preparation of elementary teachers, secondary teachers, and school service personnel, with the master's degree as the highest degree approved.

Completion of the approved teacher preparation programs of the University qualify a student for certification as a teacher in most states. There are a few which have unusual requirements for certification. The Chairman of the Department of Education will be glad to advise students regarding these requirements.

### Honors Program

The College of Liberal Arts offers an Honors Program as a possible means of challenging students of exceptional ability.

This program has three divisions: 1. Honors offerings for each of the freshman and sophomore years. At present this applies only to English 401-402 and History 401, 402. 2. Departmental honors programs, developed and administered by those departments choosing to maintain an honors program. 3. An upper-division, general honors program with two objectives: first, to provide an honors minor program for those students who wish to do honors work but whose major departments do not maintain honors programs; and second, to schedule special lectures, seminars, and other academic activities for all honors students.

To date, the following departments have adopted honors programs: English, French and Italian, German and Russian, History, Political Science, Psychology, Sociology, and Spanish and Classics. Students desiring information about a department's program should consult the department chairman.

The upper-division general honors offerings provide continuity with the freshman-sophomore honors curriculum. Should independent study be involved in such a program, a junior may register for a total of 6 credits of independent study and a senior for a total of 12 credits (of which no more than 9 are in his major field of concentration) during the academic year. This work would be done in the 695, 696 course in the relevant department, and in L.A. 695, 696 where the department has no such offering.

The honors minor program gives an honors option to a student majoring in a department not maintaining an honors program, and may be undertaken by such a student with the approval of his departmental supervisor, the Honors Council, the Dean, and a Council member teaching the subject in which the minor would be undertaken. The Council member supervises the student's activities.

It is expected that all honors students will maintain a cumulative average of at least 3.0. Further information may be obtained from the Director of the Honors Program.

### The Ford Foundation Program

A limited number of juniors are selected each year from those who apply for a special three-year program leading to the B.A. and M.A. degrees. The program is limited to superior students who expect that their chosen vocation shall be teaching at the college level. The regular requirements

for the B.A. degree and the Graduate School requirements for the M.A. degree are basic requirements. In addition the student is expected to attend a special seminar in the junior year and to engage in independent study in the senior year. During the graduate year of the program, he will be assigned to his major department as an intern in teaching.

Students should apply during their sophomore year. Further information may be obtained from the director of the program who may be contacted through the office of the Dean of the College of Liberal Arts.

### Dual Degree Programs

Under certain conditions it is possible for a student to earn two *different* bachelor degrees. A student may not earn two Bachelor of Arts degrees. The purpose of the two-degree program is to broaden the education of certain students at the undergraduate level. The program is only for those students who can adequately handle the requirements for two degrees and who can reasonably allocate the additional time and effort needed for the program.

A candidate for two degrees must complete all the curriculum, departmental, scholastic, and other requirements for each degree. It is expected he will complete five years of academic work. He may not earn a second degree in the same or closely allied major field.

If a student plans to take one of the two degrees in the College of Technology, he should register as a freshman in that College. If he does not plan to include a Technology degree in his program, he may register in any of the other three Colleges. When a student is accepted as a two-degree candidate, supervisors for each major will be appointed. These supervisors will maintain joint control over the student's academic program. Students who wish to be in this program should confer with the appropriate college dean(s), preferably no later than the end of the freshman year.

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## Bachelor of Arts Program

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The Bachelor of Arts Program provides a broad liberal education with a concentration involving at least 24 credits in a major field.

### Degree Requirements

*Satisfaction of these requirements ensures satisfaction of the University Academic Requirements.*

These requirements apply to all students who enter the College of Liberal Arts between July 1, 1967, and June 30, 1968, and are seeking a Bachelor of Arts degree.

1. 128 semester-hour credits.
2. At least a 2.0 grade-point average in all courses completed at the University of New Hampshire.
3. Physical Education: men students — Physical Education 431-432; women students — Physical Education 401, 402, 403, 404.
4. English 401-402.
5. History 401, 402.
6. Biological Science: Biology 401, 402 or Botany 411 (or Biology 405) and Zoology 412.
7. Physical Science: One of the following two-semester sequences, not in student's major department: Chemistry 401-402, 403-404; Geology 401-402; Mathematics 407-408; Physical Science 401-402; Physics 401-402.
8. Social Science: Any three semester courses selected from the following, not in student's major department: Economics 401-402; Geography 401 or 402 (only one course in Geography may be used in satisfying this requirement); Political Science 405, 406; Psychology 401-402; Sociology 400, 411, 540.
9. Humanities: One of the following two-semester sequences, not in student's major department: Any two Philosophy courses; Arts 475, 476; English 513, 514 or 515, 516; Humanities 501-502; Languages 501-502; French 503-504 or 505-506; German 501-502 or 605-606; Greek 503-504; Italian 503-504; Latin 503-504 or 505-506; Russian 501-502 or 605-606; Spanish 503-504 or 505-506; Music 403-404; Speech and Drama 431, 436.
10. Special Language Requirement: Proficiency in a foreign language at the level achieved by satisfactory work in a one-year college level course is required of all students. This requirement may be fulfilled by achieving a satisfactory score on College Board tests or by completion of beginning courses in language at the University of New Hampshire (French 401-402, German 401-402, Greek 401-402, Italian 401-402, Latin 401-402, Russian 401-402, Spanish 401-402). Students having studied a foreign language for two or three years in high school should be able to achieve a satisfactory score on the College Board tests. Placement in advanced courses in foreign languages by College Board tests or by any other approved procedure, including transfer, satisfies this language requirement.
11. Major Requirements: A student must complete at least 24 semester credits of major work with grades of C or better. The major department may specify certain required courses and may require a senior paper or project and/or a comprehensive examination. These requirements are given in the listing of majors that follows. (A Major may be selected at the end of the student's freshman year and must be selected prior to the junior year.)

More than 50 semester credits in courses in the major department constitutes excessive concentration and neither the supervisor nor the Dean of the College may approve schedules that reveal over-specialization.

## Time Sequence for Requirements

The requirements in the *Bachelor of Arts Program* are to be satisfied in the appropriate class years as indicated in the following schedule:

The Special Language Requirement should be satisfied no later than the Sophomore year.

FRESHMAN YEAR		SEMESTER CREDITS	
P. E. 401, 402	Physical Education (Women)	1	1
P. E. 431-432	Physical Education (Men)	1/2	1/2
Engl. 401-402	Freshman English	3	3
Hist. 401, 402	Introduction to Contemporary Civilization	3	3
	Biological or Physical Science* Electives	3, 4	3, 4
SOPHOMORE YEAR		SEMESTER CREDITS	
P. E. 403, 404	Physical Education (Women)	1	1
	Biological or Physical Science*	3, 4	3, 4
	Social Science	3	3
	Humanities	3	3
	Major courses and electives		
JUNIOR YEAR		SEMESTER CREDITS	
	Social Science	3	or 3
	Major courses and electives		
SENIOR YEAR		SEMESTER CREDITS	
	Major courses and electives		

## Majors in the Bachelor of Arts Program

The objectives, opportunities, and department requirements of majors in the Bachelor of Arts Program are described in the paragraphs which follow.

### The Arts

It is the belief of the Department of The Arts that art is best taught with a practical center. An experimental arts laboratory (the Student Workshop) and a continuing series of exhibitions of art are therefore basic factors in this department. The courses offered provide an opportunity, within the liberal arts framework, for the serious art student to acquire

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\* Students electing a Biological Science during their freshman year must elect a Physical Science during their sophomore year or vice versa.



a thorough knowledge of the basic means of visual expression. In addition, these courses are designed to offer foundation experience for students interested in art but who are majoring in other departments in the University.

Students majoring in The Arts must complete with the grade of C or better the following courses: Arts 431-432, *Basic Design and Drawing*, and Arts 475-476, *Introduction to The Arts*.

The Department of The Arts offers three options leading to the degree of Bachelor of Arts, major in The Arts. (The Department also offers a Curriculum in Art Education leading to the Degree of Bachelor of Science). The student majoring in The Arts has the choice of three optional programs: (1) Painting and Graphics, (2) Crafts, (3) History of Art.

### OPTION I. PAINTING AND GRAPHICS

Introductory courses in design, drawing, graphics, painting and photography, followed by a comprehensive workshop integrating all these disciplines, form the core of this option. Other courses to be pursued include art history, sculpture, and the crafts. Students will be prepared for continued professional study in the fields of painting, photography, sculpture, and design. Those students seeking careers in college or secondary school teaching will be qualified to enter a program of graduate study leading to the Master of Arts or Master of Arts in Teaching degrees. The student is required to take the following courses: Arts 541, 542, 536, 451, 650, and one upper level course within the option. Interested students should consult with the supervisor, Professor John W. Hatch.

### OPTION II. CRAFTS

Introductory courses in ceramics, jewelry, metalsmithing, weaving, and woodworking are offered in this option to acquaint the student with the basic crafts. Within this option the student is required to choose one area for concentration. The areas open are the following: ceramics, metal, weaving, and wood. The aim of this option is to provide the student with the opportunity to explore the craft field, and, by developing techniques and familiarity with materials, be adequately prepared for further study at an advanced level. Twenty-four credits in crafts courses are required in this option, with a concentration of 12 credits in one of the available areas (ceramics, metal, weaving, or wood). Interested students should consult with the supervisor, Professor Winifred Clark Shaw.

### OPTION III. HISTORY OF ART

The arts of the eastern and western parts of the world amount to a rich legacy. The courses of study in this option are designed to serve a two-fold purpose. First they make available for students in the liberal arts programs, and elsewhere in the University, an opportunity for a full histori-

cal survey of the subject. Second the courses provide a foundation in fact, theory, and historical problems for a student who desires to continue the study of this subject on the graduate level. The very number of artistic objects and the variety of creative subjects which these objects exemplify make the survey of more than one historical period necessary for competence in this subject. A student electing to major in the history of art is required to take a minimum of five survey courses (classical, modern, medieval or Renaissance, northern painting or baroque art, Oriental or American art or American architecture). In addition, the student is required to take one seminar, preferably in his senior year, Arts 797, *Seminar in Art History*, which deals with further refinement of problems the student has already discovered, as well as advanced critical and bibliographical tools. The student is expected to take courses in at least one European language, and in related areas in the liberal arts: philosophy, history, and literature. Creative talent in any area of art is not a prerequisite in this option. However, the familiarity with the techniques of the various arts and crafts offered in the department is strongly suggested. This option is designed to prepare a student for further work in three professional areas: teaching, museum work, conservation. Interested students should consult with the supervisor, Professor James A. Fasanelli.

## Biology

Students who are interested in a broad background in the life sciences are advised to major in Biology. Such students will be required to take courses in botany, entomology, microbiology, and zoology in building up a program. The field, however, is so inclusive that the majority of students will find it desirable to include one or two additional courses in one of the subdivisions, such as Botany, Microbiology, or Zoology. In addition to students who desire to study Biology for general education, it is suggested that those who are interested in Applied Biology and Secondary-School Teacher Preparation register as Biology majors.

Students who are planning to teach Biology in secondary schools are urged to plan for practice teaching during the senior year. As few positions are available in any year for teaching Biology alone, a student should include courses in his program of study which will qualify him for teaching other sciences.

Students preparing for positions which involve the application of the science of Biology, such as those frequently listed by the federal civil service, the state governments, and industry, should follow the general program of Biology majors and should elect one or two additional courses in fields of Applied Biology. The Division is well fitted to assist in the preparation of students for work in fish and game research, conservation education, and in state departments of conservation. Students preparing for professions in this group should plan to secure advanced degrees, since positions



in these fields are difficult to secure without graduate study. Students who are interested in hospital laboratory work should consult the *Medical Technology* curriculum.

Satisfactory completion of the requirements of a Biology major will generally qualify students for admission to graduate schools to specialize in Biology or in one of its major subdivisions. Students planning to major in Biology should elect, as prerequisite, Biology 405 (or Botany 411) and Zoology 412.

The minimum course requirements for Biology majors will include: Microbiology 503; Botany 503 and one other course selected from Botany 506, 742, or 756; Entomology 402; 7 credits in Zoology (beyond Zoology 412, excluding Zoology 795, 796). Additional courses will be selected from those offered in the Division to total at least 24 semester credits with a grade of C or better. Biology majors are also required to complete (in addition to the 24 hours of major credit) Chemistry 403-404 and eight hours in physical science (further Chemistry, Geology, Mathematics, Physical Science 401-402, or Physics).

Students interested in majoring in Biology are advised to consult with the supervisor, Professor Paul E. Schaefer, Department of Zoology.

### Botany

Students who are interested in plant life are advised to consider registration as majors in Botany. Botany majors with suitable undergraduate backgrounds may enter the field of secondary education or become research technicians. Botany majors, other than those whose interest is secondary-school teaching, research technique, or a general education, should expect to continue in graduate study here or elsewhere. Government work, institutional research, certain types of industrial positions, and college teaching are open to Botany students with advanced preparation. The principal fields of concentration in Botany are: (1) Pathology, (2) Physiology, (3) Taxonomy, (4) Ecology, (5) Morphology and Anatomy, (6) Cytology, (7) Phycology (Algae).

Students who major in Botany must complete courses offered by the Department to a total of 24 semester credits with grades of C or better. Credits from courses in other departments closely related to the major courses may be included as part of the required credits with the consent of the major supervisor. A broad background in chemistry and other biological sciences is considered essential for most students who major in Botany.

The courses of each major program are selected to meet the needs of the individual student, as determined by the student and his supervisor in personal conference.

Students interested in majoring in Botany are advised to consult with the supervisor, Professor Albion R. Hodgdon.

## Chemistry

Students who are interested in the study of Chemistry will find opportunities in such fields as individual work involving the development of processes or production activities or sales work based on a scientific knowledge of the marketable products, the teaching of Chemistry and allied subjects in secondary schools or of Chemistry in colleges, and graduate study for those students who are interested and particularly proficient in their undergraduate work.

The University offers two channels for study of Chemistry: majoring in the subject in the College of Liberal Arts, or enrolling in the Prescribed curriculum in Chemistry in the College of Technology. Students majoring in Chemistry in the College of Liberal Arts may have a wide variety of interests and differing abilities in science. In order to be well prepared for graduate school or a career in chemistry, each student should have the following courses as a minimum: Chemistry 405-406 or 403-404 and 521; 547-548; 661-762; 683-684; 685-686; and at least one Chemistry course in each semester of the senior year; Physics 401-402 (Physics 404, 501-502 desirable for the capable student); Mathematics 421 or 425 (Mathematics 422, 523 or 426 strongly recommended for the capable student); German (at least 4 credits) with Russian a possible alternate. According to the student's interests, other supporting subjects may be elected to form a broad program of study and to prepare for one of the opportunities listed above.

The Department is equipped to furnish the preparation necessary for teaching Chemistry in secondary schools. As very few positions are available in any year for teaching Chemistry alone, a student should consider a program of study which may qualify him for teaching Chemistry and other sciences, and should consult with the Chairman of the Department of Chemistry and the Chairman of the Department of Education. Students who are interested in teaching Chemistry in college are advised to plan on graduate study.

Students who plan to major in Chemistry are advised to consult with Professor Alexander R. Amell of the Department of Chemistry as early in their college program as possible.

## Chemistry and Physics

This major is designed for students who wish to teach chemistry and physics in secondary schools. The number of positions available for teaching only chemistry or physics is limited, and there are many opportunities to teach both subjects on the secondary school level. Chemistry and physics majors will have good preparation for teaching these subjects and will have the necessary mathematics and education background.

Minimum course requirements for the major include: Chemistry 405-406; 545; 683-684 or 786; 685-686; Mathematics 421-422-523 or 425-426;

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Physics 404; 501-502; 605; 503; 611; and the education courses in the University Teacher Preparation Program. To be eligible for the required student teaching course, the major must have a cumulative average of 2.2, an average of 2.5 in the required chemistry and physics courses, and a 2.5 average in the required education courses.

Students interested in majoring in Chemistry and Physics should consult with the Department of Education and with either Professor Alexander R. Amell of the Department of Chemistry or with Professor Robert E. Houston of the Department of Physics.

### Earth Science

The major in Earth Science is specifically designed to provide a subject-matter background for students planning to teach Earth Science in secondary school. Students who major in Earth Science must complete the following minimum requirements with grades of C or better: Geology 401-402, Geography 473, Physics 406, Chemistry 401-402, Physics 401-402 or Mathematics 407-408 and 10 to 12 credits elected from intermediate and upper level undergraduate Geology courses and/or Geography 570.

Students interested in a major in Earth Science should consult with the supervisor, Professor Herbert Tischler, Department of Geology and Geography. Prospective majors are also advised to consult with the chairman of the Department of Education about a program of courses in education leading to secondary school teacher certification.

### Economics

A major in Economics, with requirements quite similar to those for a Bachelor of Arts degree in the College of Liberal Arts, is offered by the Whittemore School of Business and Economics. Interested students should consult the Dean of that School.

### Education

The University offers undergraduate programs to prepare teachers for both elementary and secondary schools. General information about these programs is given in the section on Preparation for Teaching.

Students planning to teach in secondary school *do not major* in the Department of Education. They major either in the subject-matter department in the Bachelor of Arts Program, electing the courses in the University Teacher Preparation Program (see section entitled Preparation for Teaching) or they elect one of the curricula in teaching (see section entitled Bachelor of Science Curricula).

Students planning to teach in elementary schools do major in the Department of Education as Elementary Education majors. This major is an unusual one combining strong liberal arts preparation with a full year of professional study. For the first three years the student follows the Bache-

lor of Arts Program. During these years the student must satisfy all of the College requirements, complete 18 semester credits of planned study in a selected liberal arts subject, pass Education 481 or Home Economics 425 with a grade of C or better (no additional Education course may be taken), demonstrate a personality suitable for teaching, gain experience working with groups of children, and have a cumulative grade-point average of at least 2.2. The entire senior year is devoted to professional study and student teaching by enrolling in Education 741-742, a 32-credit course. Students interested in this program should consult with Professor Deborah Stone or Professor Roselmina Indrisano as early as the sophomore year.

Several courses in Education are designed to be of interest to the general student as well as to the prospective teacher. Courses in child growth and development, educational psychology, and principles of education are substantive rather than procedural and thus are appropriate for any student who wishes to gain a better understanding of the American public school system.

### English

The Department of English offers two programs of study: the English Literature major and the English Teaching major.

The English Literature major must complete English 513 and must earn grades of C or better in 24 semester credits in literature courses numbered above 750; 6 credits must be in Shakespeare (English 757, 758), 6 credits in American literature (this requirement may be satisfied by English 515, 516, but the 6 credits thus earned cannot be counted toward the 24 major credits), and an additional 12 credits in at least three centuries of English literature prior to the twentieth.

The English Teaching major must meet the state certification requirements for teaching. He must also take the following courses, which must be passed with an average of 2.5 or better:

English 501	English 757 or 758
English 513, 514	English Education 791
English 516	Speech 504, 658, or English 521
English 705	Speech 508
English 709, 710, 711	

Students who are interested in majoring in English should consult with the supervisor, Professor John C. Richardson.

### Entomology

The Department of Entomology offers various courses for students who wish to specialize in the study of insect life, insect control, and insects in relation to man. There are many fields open to those qualified in Entomology. There are opportunities for employment in public institutions and organizations, and in addition, there are many opportunities for employ-

ment with commercial and industrial firms which frequently employ college graduates who have majored in this field of study. Graduate study is desirable for the student who seeks high achievement in Entomology.

Students who major in Entomology are expected to complete successfully courses offered by the Department, to a total of 24 semester credits, with grades of C or better. Courses in other departments may be counted with the consent of the major supervisor.

Outlines of specific suggested programs of study are available to the student upon request to the supervisor, Professor James G. Conklin.

### French

The Department of French and Italian offers at the present time a major in French only. The supervisor for majors is Professor Louis J. Hudon.

A major consists of a minimum of 24 credits. French 401-402, 503-504, and 514 do not count toward a major. French 790 is required of majors. The student will be encouraged to take courses in related fields such as English, history, art, music, and philosophy.

In addition to the regular major program, the Department offers an Honors Program which consists of a senior seminar and a senior research project and paper (French 695, 696).

The Department also offers a Junior Year Abroad at the University of Dijon. This program is open to all qualified students at the University of New Hampshire. See Description of Courses, French 685-686.

### General Physical Science

A student having broad interest in physical science, but no professional objective in any one of the recognized sciences in this field, may register as a General Physical Science major. Many students who have majored in General Physical Science have combined this specialization with courses in education leading to secondary school teacher certification.

Students who major in General Physical Science must complete each of the following courses and achieve in them an overall grade point average of 2.3 or better: Mathematics 407-408 and either 421, 422, or 425, 426; Chemistry 403-404 and 521; Geography 473 and 570; Geology 401-402; and Physics 401-402 and 406. Students who are interested in choosing *General Physical Science* as a major should consult with the supervisor, Professor Herbert Tischler.

### Geography

Geography satisfies man's ancient curiosity about distant places and, less exotically, his need for further knowledge of the "home area." Modern geography is best defined as the discipline that describes and interprets the variable character from place to place of the earth as the home of



man. As such, geography is an integrating discipline, studying many types of phenomena that are significant to understanding the character of areas or places. Because its integrating character brings it into contact with many other fields of knowledge, geography forms an excellent core discipline for a liberal education. Thus, students who have a basic curiosity about areas or the regions of the world, and desire a liberal education can effectively obtain one by majoring in Geography. Those wishing to prepare for careers as professional geographers are advised to concentrate their course work in geography and closely related fields, and should plan to go on to graduate training after completing an undergraduate major in geography.

Today, as in the past, most professional geographers hold positions in educational institutions, and the demand for personnel in this field can only increase. In addition, many geographers now find employment for their skills in various branches of the Federal and state governments, in regional and city planning, and in market research and plant location services for business and industry.

Students who major in geography are required to take Geography 401 and 402, and additional courses in Geography or related fields approved by their supervisor to a total of 24 semester credits with grades of C or better. The 24 credits should include Geography 481; 471, 472; nine credit hours of intermediate level courses; the seminar in geography; and three credit hours of Geography 795.

Students who are interested in majoring in Geography should consult with the supervisor, Professor William H. Wallace.

## Geology

The aim of the geological sciences is to reconstruct the physical and biological history of the earth by the study of the formative processes acting on the earth. Geology includes a study of the constituents that make up the earth, an understanding of the evolution of the earth's structural framework and surface features, and an interpretation of changes in life and the biological environment through time.

The need for men trained in the earth sciences has been emphasized by the search for essential mineral resources, the expansion of geological research especially in the marine sciences and in extraterrestrial geology, and by the increase in the teaching of earth science in the secondary schools throughout the country. (See major in Earth Science.)

Positions as mining geologists, petroleum geologists, mine operators, federal and state survey geologists, and university and college professors of geology and mineralogy have been successfully filled by graduates of the University who have majored in geology. Other former major students are teaching in high schools or are in business, some in fields where their geologic preparation is useful.



## College of Liberal Arts

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Students who major in Geology are expected to complete Geology 401-402, and, in addition, courses in Geology or related courses approved by the supervisor to a total of 24 semester credits with grades of C or better. The courses of each major program are selected to meet the needs of the individual student, as determined by the student and his supervisor in personal conference.

At the end of the senior year, a student who majors in Geology must, after consultation with his supervisor, submit either a thesis or pass a written comprehensive examination.

Students who are interested in majoring in Geology are advised to consult with the supervisor, Professor Herbert Tischler.

### German

The Department of German and Russian offers a major in German only. The supervisor for majors is Professor Hermann W. Reske. This program is designed to be of interest to the following group of students:

(1) Those who have a special interest in the German language and literature and are free to pursue it.

(2) Those who intend to enter professions in which a background in foreign languages and literatures is desirable. An example of such a profession is library science. Most library schools require training in two foreign languages.

(3) Those who plan to teach the German language in secondary schools. Since most secondary schools require their teachers to teach more than one subject, students planning to enter teaching at this level must plan their programs carefully. They should combine a major in one of the languages and its literature with a minor or at least a meaningful sequence of courses in another subject.

(4) Those who intend to go on to graduate study in the field of German language and literature. Such graduate study is requisite to teaching at the college level and to other specialized work in the field.

A major must comprise a minimum of 24 major credits in the German language and literature. German 401-402 cannot be counted for major credit.

### History

History, as a field in which to major, may be of interest to the following groups of students: (1) Those who wish to pursue a career as a college teacher of history. Graduate study is indispensable, but preparation may be made by a certain amount of undergraduate specialization. (2) Those who plan to teach history in secondary schools. For such a position, training in other social studies is highly desirable, if not absolutely necessary. The student is therefore advised to consult with the Department of Education, as

well as with the Department of History, with a view to satisfying teaching certification standards. (3) Those who intend to enter other professional fields in which a considerable amount of historical knowledge is desirable. Such a field, for example, might be that of library training in which a historical preparation would rank with study in literature as a background, or the increasingly important profession of archivist. (4) Any students who feel free to plan the college program without too specific reference to a vocation, and who have a special interest in history.

Students who major in history must earn 24 semester credits in courses in History (exclusive of History 401, 402) with grades of C or better. These 24 credits should include a minimum of six semester credits each from Group I, Group II, and Group III (see the description of courses offered by the Department), and 12 semester credits of the 24 should be in courses numbered above 600. A student who majors in History must prepare a satisfactory paper in his field of concentration or take a comprehensive examination. If the student writes the paper, he must secure approval of the subject chosen from the Chairman of the Department before December 15 of the student's senior year, and the completed paper must be filed with the Chairman before April 15 of the year in which the degree is to be granted. If a student wishes to take the comprehensive examination instead of writing the thesis, he must notify the Chairman of the Department of his decision by December 15; the examination will be given on a pre-arranged day shortly before April 15.

Students planning to major in History should consult with the Chairman of the Department, Professor William R. Jones.

### Latin

See Spanish and Classics.

### Mathematics

Career opportunities in mathematics include teaching at both secondary and college levels and scientific research and consulting work in business, industry and government. Many positions are open to holders of the B.A. degree with a major in Mathematics. Most such positions require a solid foundation in basic mathematics and provide on-the-job training in any specialties involved. On the other hand, the number of positions in mathematics that require graduate work is steadily increasing. Fortunately, the program required for admission to a graduate school in mathematics is similar to the program required by most industrial employers. The following Mathematics courses are designed to meet these ends: 425-426 or 421-422-523, 527, 528, 531, 761-762, 767-768, and two additional Mathematics courses.

While most secondary school teachers do graduate work, most of them begin their teaching careers on the basis of the B.A. degree. Thus, the

undergraduate program of the prospective secondary school mathematics teacher should include adequate preparation for the position. Current trends in secondary mathematics curricula demand a high level of specialized training for the teacher. The following courses are designed to meet these demands: Mathematics 425-426 or 421-422-523, 531, 542, 761-762, 755, 791 and two additional Mathematics courses; Education 481, 757, 758, 759 (794 also recommended).

A student who majors in Mathematics must complete one or the other of these sequences.

Prospective Mathematics majors are advised to include calculus in their freshman year programs and to consult as early as possible with the Chairman of the Mathematics Department, Professor M. Evans Munroe.

### Microbiology

Students interested in the study of microorganisms, including the bacteria, rickettsiae, and viruses, should register as majors in Microbiology. Such students may prepare themselves for a career in city, state, or federal government service, or a position with universities, research institutes or industrial organizations. Opportunities are available in the areas of general microbiology, medical, public health, or veterinary microbiology, environmental microbiology, and industrial microbiology.

Students who major in Microbiology are expected to complete courses offered by the Department, and by related departments, to a total of 24 semester credits, with grades of C or better. A course in Organic Chemistry is required of Microbiology majors, but cannot be counted as part of these 24 major credits. It is strongly recommended that students also take a year's work in mathematics and physics, and a semester of biochemistry. The courses of each major program are selected to meet the needs of the individual student, as determined by the student and his supervisor in personal conference.

Students interested in majoring in Microbiology are advised to consult with the supervisor, Professor William R. Chesbro.

### Music

Studies in the major program in Music, such as history, literature, and appreciation of music, endow the student with cultural values which enrich his entire life. Instruction offered in the Department is designed to develop musicianship, the ability to perform and capacity to teach, supplemented by the general liberal arts program offered by the College. The broad scope of subjects available within the Department equips the student with a basis for professional competency and at the same time provides the foundation and stimulus for graduate study.

Instrumental and vocal instruction are given in private lessons, while class instruction provides for the pursuit of academic studies. Student re-

citals, instrumental and vocal ensembles, Men's and Women's Glee Clubs, the University Concert Choir, Symphony Orchestra, and Symphonic Band afford both laboratory and concert experience in a variety of performance settings.

The expanding and dynamic force which music is fast becoming in contemporary American society is reflected by increased demands for teachers of music, performers, music librarians, radio, recording, and television musicians, music therapists, and higher standards of quality and performance of music in places of worship.

(The Department of Music also offers a Curriculum in Music Education leading to the Bachelor of Science degree, and a Bachelor of Music degree allowing for concentration in Applied Music and in Theory).

A major in Music is offered with three options in concentration. All students must complete the requirements of the basic theory courses: Music 421-422, 521-522, and 523-524, and the basic history-literature course, Music 405-406. In addition, the specific requirements of each option are given below:

**OPTION I. Music History:** advanced theory (4 credits); advanced history and literature (12 credits); Music 570 and/or Music 573 (8 credits).

**OPTION II. Applied Music:** qualified students may major in voice, piano, organ, strings, woodwind or brass (a student choosing this option must pass a performance examination before the Department of Music staff); advanced theory or literature (4 credits) and applied music (16 credits — 2 credits per semester). Voice majors must take the following languages to graduate in this program: Italian 401; German 401; French 401. A senior recital also must be presented.

**OPTION III. Theory:** emphasis on musical composition; advanced theory (12 credits), advanced history (4 credits), and Music 570 (8 credits).

Students majoring in Music must earn grades of C or better in all required Music courses.

The Department of Music is a Member of the National Association of Schools of Music.

Prospective majors in Music are advised to consult with the Chairman, Professor Donald E. Steele.

### Philosophy

The Greeks understood philosophy as the love of wisdom, that ardent desire to know which Aristotle called the natural aspiration of all men. From this original impulse toward knowledge the sciences and the humanities developed. The goal of the special sciences is the detailed study of limited fields of inquiry. Philosophy aims at a comprehensive knowledge of the whole, a single perspective which will include things as seemingly diverse as matter, space, time, spirit, society, beauty, and the divine. And

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since wisdom is not quite the same thing as knowledge, philosophy also seeks to bring together the discoveries of the special sciences, to assess their significance, and to apply this knowledge to the conduct of life.

Courses in Philosophy, taken early in a student's program of study, provide an introduction to some of the dominant themes in the history of ideas and enable the student to get a view of the forest in which he will later examine the trees. Taken near the end of his studies, such courses afford a perspective of where the student has been and how much he has left unexplored. Philosophy 410 at the introductory level, is designed to present such an inclusive view as well as to acquaint the student with the specific nature of philosophic inquiry and with some of the fundamental philosophic problems. Courses in the intermediate group provide for more systematic inquiry in the history of philosophy and in some of the more important branches of the subjects in which problems common to philosophy and other disciplines, such as art, literature, religion, and psychology, can be investigated. The advanced courses are for majors and for other students willing to acquire the necessary background for such work. In most cases, such background can be acquired by taking Philosophy 500, 501.

Students who major in Philosophy must earn grades of C or better in the following courses in Philosophy: 400, 500-501; two of the following three courses, 610, 615, 620; and eight hours of work in the following group, 700, 701, 795, 796.

At the end of the senior year, students majoring in Philosophy must pass a comprehensive written-oral examination covering the History of Philosophy and some field of systematic study (e.g., ethics, aesthetics, metaphysics). A student majoring in Philosophy will present to the Department by February 1 of his senior year a senior paper on a topic of his own choice in consultation with the Department. The comprehensive oral examination will be based in part on the senior paper.

Students interested in majoring in Philosophy should consult with the supervisor, Professor Robert P. Sylvester.

### Physics

Students who wish to major in Physics will find a program which will prepare them for further study or for careers in teaching and research in this exciting field. The Department offers a group of intermediate courses which with parallel work in mathematics are part of every physicist's background. Laboratory work forms an important portion of each year's program and there are opportunities for students to become associated, if they wish, with one of the research programs being actively pursued by the Department.

Graduates who have followed this program can find wide opportunities in industry and government laboratories or in secondary school teaching.



If they have done well, they can continue their professional training in graduate school which will prepare them for the more responsible positions in the field. Even without more advanced work, graduates find this curriculum an admirable foundation for further study in other fields.

Students are required to complete 24 semester credits, in addition to the introductory courses, with grades of C or better. A student must elect physics 501-502, preferably in the sophomore year, as an introductory course. If Physics 401-402 is elected in the freshman year, a student may be placed in an advanced section of Physics 501-502. If Physics 404 is elected in the freshman year, the regular sequence may be taken in the sophomore year. Since proper preparation in mathematics is essential, the student should elect Mathematics 425-426, in the freshman year if possible, in order to have the prerequisites for the courses that follow. If Mathematics 407 has been passed with a grade of B or higher, students in the College of Liberal Arts may be admitted to Physics 404 with the specific approval of the Department of Physics. Liberal Arts students who wish to register for advanced courses in Physics should discuss the mathematical prerequisites with the Department of Physics. Seniors are required to participate in a colloquium, Physics 611-612.

The Department is able to furnish the preparation necessary for teaching physics in secondary schools. As very few positions are available for teaching physics only, a student should consider a program of study which will qualify him for teaching physics and another science, such as mathematics, biology, or chemistry. The student interested in such a program should consult with the chairmen of the departments of Education and Physics. Students who wish to major in Physics are advised to consult the Department Chairman early in their college program.

### Political Science

The courses offered by the Department of Political Science are designed to provide a knowledge of the nature, functions, and problems of government and politics on local, state, national, and international levels. Basic courses are intended to contribute to a liberal education. More advanced courses afford preparation for professional work and also lead to specialization in the fields of political science, law, government, public administration, or political theory.

Government, professional consultants, educational institutions, and research organizations as well as the foreign service, civil service, and others seek graduates of Political Science programs. Students who are preparing to teach government courses in the secondary schools should coordinate their study program with the Department of Education. Students desiring to pursue graduate work should make arrangements to take the Graduate Record Examination early in their senior year. Details may be obtained from the Political Science Department.



Political Science majors interested in gaining practical experience and knowledge in public affairs may subscribe to a program affording an opportunity to work as an intern in an approved public or private agency. Enrollment in Social Science 681 requires the permission of the Chairman.

Political Science majors interested in international affairs may designate the International Relations Option with the permission of the Chairman of the Department. The option will normally comprise 36 credits in Political Science courses and 18 credits from related fields. Since this emphasis will require additional course work outside of the Department, the candidate should carefully review his preparation and program with the departmental coordinator before making application.

Majors in Political Science are required to take Political Science 405 and 406 with grades of C or better. Students who expect to major in Political Science are advised to register for these courses during the freshman or sophomore year. Students majoring in Political Science are also required to complete a research paper approved by the staff. A major consists of a minimum of 24 semester credits of work with grades of C or better in Political Science and in any related courses which may be approved by the supervisor. The 24 semester credits should include not less than 12 in courses above 600. Not more than 9 credits earned as an intern in Social Science 681 may be counted toward the completion of the major requirements. Each student will be counseled individually and his program of study planned for his needs. Opportunity is available for the more able student to share in a program of Independent Study within the Department and in an Honors Program.

Students interested in electing Political Science as a major should meet with the Chairman of the Department.

### Psychology

A primary function of the Department of Psychology is to provide an academic major that will contribute to the liberal education of the undergraduate student. It is hoped that the experiences provided by the major will help to develop the broad viewpoint that is so highly valued as a characteristic of the liberal arts graduate. It is intended that, by majoring in Psychology, the student will develop an appreciation of the role of scientific method in studying behavior and at the same time achieve a better understanding of the complex and simple behavior of both humans and non-humans. Some students may wish to major in Psychology in order to prepare themselves for graduate study and a career in one of the following fields: college teaching and research, clinical practice, counseling and guidance in secondary schools and colleges, full-time research with private or governmental agencies, personnel work in industry or government; psychological testing and supervision in mental hospitals, juvenile courts, public schools, or child guidance clinics. For nonmajors, the study of psy-

chology will be helpful in preparing for careers in teaching, nursing, social work, business or industrial management, and professions such as medicine or law, in which the understanding of human relations is of great importance.

Students who major in Psychology are required to complete 24 semester credits with grades of C or better in courses in Psychology or in such related courses as may be approved by the Department. Each student majoring in Psychology must complete nine credits from the following group: Psychology 567, 568, 758, 776, 778, 783. He must also complete six credits from Psychology 537, 663, 744, 754, 760, 780. All majors must take and pass with a grade of C or better Psychology 567 and 797. Finally, all majors must pass a departmental comprehensive examination that is offered as part of Psychology 797.

Psychology 695 is an honors course that is open to seniors who have a 3.0 grade point average in Psychology courses and who are sponsored by a member of the staff. Any Psychology major who plans to go on to graduate work should take Psychology 568.

Students who wish to major in Psychology should consult with the Chairman, Professor Raymond L. Erickson.

### Sociology

The major in Sociology is for students who desire a liberal education with emphasis on study of the organization and differentiation of society, including study of the research methods developed in recent years for a better understanding of social phenomena; students who intend to do graduate work in sociology; or students who plan to attend a graduate school of social work but prefer a different choice of undergraduate electives than the Social Service curriculum permits.

(The Department also offers a Bachelor of Science Curriculum in Social Service which, with its field experience and its concentration on pre-professional courses, not only prepares students to enter graduate schools of social work but also has been quite successful, for a number of years, in preparing them for junior positions in social work.)

Students who wish to teach sociology in secondary schools are advised that such teachers usually have to teach related social studies. Students with this vocational aim should consult with the Chairman of the Department of Education.

It is recommended that majors in Sociology take Sociology 400 during their freshman or sophomore years. They must complete a minimum of 24 semester credits with grades of C or higher in Sociology (or in any related course approved by the supervisor). Sociology 711, 712, 698, 701, 702, and 640, 641, 642, are required. During the second semester of the senior year majors must pass a written comprehensive examination.

The Department offers an Honors Program to give the superior student

an unusual opportunity to perform scholarly research in the field of Sociology and Anthropology. Sociology or Social Service majors may be admitted to the program if they have a University grade point average of 3.0 or higher and a similar average in Sociology courses. Honor Program students will take Sociology 695, 696, in their junior year and Sociology 795, 796, in their senior year.

Students who are interested in choosing Sociology as a major should consult with Professor Stuart Palmer.

### Spanish and Classics

The Department of Spanish and Classics offers majors in Latin and Spanish. The supervisor for majors in Latin is Professor John C. Rouman; and for major in Spanish, Professor Charles H. Leighton. These programs are designed to be of interest to the following groups of students:

1. Those who have a special interest in one of these languages and the literature written in it.
2. Those who intend to enter professions in which a background in one of these languages and its literature is desirable.
3. Those who plan to teach one of these languages in secondary school. Such students must plan their programs carefully so as to include the requisite courses in education and a minor in another subject.
4. Those who intend to go on to graduate study in Latin or Spanish. Such graduate study is requisite to teaching at the college level and to other specialized work involving these languages, their culture, or their literature.

Students majoring in the Department of Spanish and Classics must designate either Latin or Spanish as their particular major. A major must comprise a minimum of 24 credits in the particular language and its literature. The following courses cannot be counted for major credit: Latin 401-402 and Spanish 401-402.

The Department offers Honors programs in both languages for its majors. Participation in the Honors Program entails:

1. Satisfaction of the regular major requirements
2. Additional work in the junior and senior years to be done in connection with courses numbered 641 and above. The Honors candidate must take at least five three-credit courses at this level and do additional work equivalent to one semester-hour in connection with each.
3. A senior research project and paper (695, 696 courses) to be the equivalent of six semester-hours
4. A comprehensive examination on the major language and its literature

A candidate's performance will be evaluated by a committee appointed by the supervisor under whom the student is working. It will include the members of the section in question plus a member of some other depart-

ment in the Humanities Division. The latter will be chosen on the basis of his direct concern with the field in which the candidate has specialized.

### Speech and Drama

The Department of Speech and Drama offers a major with three options: General Speech, Drama, and Speech and Hearing Therapy. A major in either General Speech or Drama makes an excellent focal point for those students desiring a liberal education combining course work in the humanities, literature, the arts and social sciences. The purpose of this major is to offer a broad program for students interested in: a liberal education stressing the speech arts; a pre-professional background for careers in such fields as public service, teaching, law, ministry, public relations, social administration, and personnel work; basic preparation for the teaching of speech and drama, direction of debate, drama and other speech activities in secondary schools, community theater direction, and professional training for television, theater, and speech correction. The major option in Speech and Hearing Therapy is a pre-professional program. Although it is possible, upon completion of the Bachelor's degree, to obtain certain State Department of Education credentials for employment as a speech and hearing clinician in the public schools, membership in and certification by the American Speech and Hearing Association requires a Master's degree or its equivalent.

Those seeking a major in General Speech should acquire a good background in English language and literature, history, government, philosophy, and psychology. They should be able to speak and write well, and they should acquire a reasonable proficiency in public speaking and oral reading.

Those seeking a major in Drama should combine that study with a wide variety of liberal arts courses in such fields as history, dramatic literature, philosophy, the arts, music, and psychology.

The following three-credit courses are required of all Speech and Drama majors: Basic Speech (without major credit), Speech Communication (without major credit in General Speech), and Introduction to Theater (without major credit in Drama).

For majors in the *General Speech* option, the following three-credit courses are required: either Discussion or Debate, Theater and Its Drama, Rhetoric in the Western World, Stagecraft, and Speech Correction. Six credits are also required in specific courses in literature in related departments as approved by the major adviser and not also used to satisfy College, or University requirements. Each student's individual program will be considered with regard to breadth and individual needs in assigning courses in related departments. Approval must be secured in advance of registration for credit for courses in this area. Individual students may be allowed to substitute Television and Radio Workshop for Stagecraft with

the approval of the major adviser. Stagecraft will contribute considerable background for the course in Television and Radio Workshop.

For majors in the Drama option, the following three-credit courses are required: Theater and Its Drama, Stagecraft, Acting, Directing, and Scenic Design and Lighting. Six credits are also required in specific courses in dramatic literature in related departments with the same provisions as in the General Speech option.

For majors in the Speech and Hearing option, the following courses are required. Basic Speech and one general speech course (without major credit); Speech and Voice Science, Phonetics of American English, Speech Correction, Clinical Methods, Procedures and Practices of Rehabilitation Methods, Speech Practice, Audiology, and one additional course in the Department other than in Speech and Hearing.

It is recommended that a minor in related fields, such as Psychology and/or Education, be taken by majors in the Speech and Hearing option.

All majors will be required to write a satisfactory paper and/or satisfactorily complete a special project during their senior year. The student must secure approval of the subject of the paper and/or the special report from his major adviser before the Christmas vacation of his senior year and file the completed paper and/or project with the major adviser before the 15th of May of the year in which his degree is to be granted.

To count for major credit the courses required must be completed with a grade of C or better.

Students who wish to major in Speech and Drama should consult with the supervisor, Professor Joseph D. Batcheller.

### Zoology

Zoology, the science of animal life, is the study of the structure, functions, development, and classification of the various animal forms. The student may major in Zoology because of a general educational interest in the subject, because of his avocational interest in nature study, or to prepare for professional work in pure science or in applied zoology. Fish and game research, important in the conservation of our natural resources, is an example of applied zoology. Students who are interested in entering the fields of applied zoology should plan to secure advanced degrees since positions in these fields are difficult to obtain without graduate study. Undergraduate preparation for students who are interested in applied zoology generally should parallel that of any students planning to enter graduate work in zoology.

The University's location on tidewater and near the open ocean provides an unusual opportunity for the study of marine zoology and marine ecology.

Students planning to major in Zoology should elect, as prerequisite, Biology 405 (or Botany 411) and Zoology 412.



All Zoology majors must earn grades of C or better in 24 semester credits of intermediate and advanced work in Zoology, except that 6-8 hours in related departments may be counted for major credit with the consent of the supervisor. The Zoology major shall include Zoology 507-508, 706, and 729. In addition to the 24-hour major credits, Zoology majors must complete Botany 503 or 506, Chemistry 403-404, a course in organic chemistry (Chemistry 545, 651-652, or Biochemistry 501), and a semester of college physics.

Students who are interested in a Zoology major should consult the supervisor, Professor Philip J. Sawyer.

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## Bachelor of Science Curricula

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The Bachelor of Science Curricula permit considerable specialization in preparation for several professional activities while conserving and developing the breadth and general culture of the students enrolled in them. Curricula are offered in: Art Education, Medical Technology, Music Education, Nursing, Occupational Therapy, Physical Education (men), Physical Education (women), Recreation and Parks, Social Service.

### Degree Requirements

These requirements apply to students who enter the College of Liberal Arts between July 1, 1967, and June 30, 1968, and who are seeking a Bachelor of Science degree.

1. 128 semester-hour credits (134 in the Nursing Curriculum).
2. At least a 2.0 grade-point average in all courses completed at the University of New Hampshire.
3. All the University Academic Requirements as listed on page 73.
4. Specific Curricula Requirements: These are presented in the detailed listing of the Curricula. Note that some Curricula have special quality requirements. Courses are to be completed generally in the sequence in which they are arranged.

More than 66 semester hour credits in professional courses in a Bachelor of Science curriculum constitutes excessive concentration and neither the supervisor nor the Dean of the College may approve schedules that reveal over-specialization

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### Art Education Curriculum

This curriculum is designed to prepare teachers and supervisors of art in the public schools. It is based upon the demands for teachers who possess developed skills in the arts and a broad general culture in addition to a specialized preparation in Art Education. The satisfactory completion of the curriculum will satisfy the initial certification requirements for teachers of art in the public schools in New Hampshire and in other states.

Freshmen who plan to enter this curriculum should elect Arts 431-432 Basic Design and Drawing and Design in their first year program.

A cumulative grade point average of 2.2; a grade point average of 2.5 in all Art courses, and a grade point average of 2.5 in all Education courses, including Art Education 791, 792; are required to be eligible for Education-Art 794, *Supervised Teaching*.

Students seeking to transfer to the University of New Hampshire from other accredited collegiate institutions must arrange an appointment with the supervisor of the curriculum or the Department Chairman prior to admission to the curriculum in order that the applicant may be fully aware of the program to be followed in completing the requirements for the degree.

Interested students should consult with the supervisor, Professor George R. Thomas.

# College of Liberal Arts

FRESHMAN YEAR		SEMESTER CREDITS	
P.E. 401, 402	Physical Education (Women)	1½	1½
P.E. 431-432	Physical Education (Men)	1	1
Engl. 401-402	Freshman English	3	3
Hist. 401, 402	Introduction to Contemporary Civilization	3	3
Group B	Natural Sciences	3, 4	3, 4
Arts 431-432	Basic Design and Drawing Electives	2	2

SOPHOMORE YEAR		SEMESTER CREDITS	
P.E. 403, 404	Physical Education (Women)	1	1
Arts 401, 404 (or)	Ceramics	3	3
Arts 402, 403			
Arts 541, 542	Advanced Drawing and Painting	3	3
Art-Ed. 493	An Introduction to Art Education		2
Educ. 481	An Educational Psychology of Development	3	
Group C	Social Sciences	3	3
Group D	Humanities (other than Arts 475, 476) Electives	3	3

JUNIOR YEAR		SEMESTER CREDITS	
Arts 407	Crafts	3	
Arts 536	Graphic Arts	3	
Arts 538	Graphic Design and Illustration		3
Arts 475, 476	Introduction to The Arts	3	3
S. and D. 459	Stagecraft		3
Educ. 757	Principles of Human Learning	3	
Educ. 758	Principles of Teaching		3
H.E. 531 (or)	Interior Design		
Arts 455	Drafting and Architectural Design Electives	3	

SENIOR YEAR		SEMESTER CREDITS	
Arts 643 (or)	Advanced Painting and Composition	3	
Arts 544	Water Media		
Art-Ed. 792	Problems of Teaching Art in Elementary Schools	3	
Art-Ed. 791	Problems of Teaching Art in Secondary Schools	3	
Educ. 759	Principles of Education	3	
Ed.-Art 794	Supervised Teaching		14
H.E. 765 (or)	History of Costume		
	An approved elective	3	
	Electives		

## Medical Technology Curriculum

There is now a large and increasing demand for medical technologists. Public health and medicine depend more and more upon the laboratory. Professional technicians are needed to perform various laboratory techniques and tests, such as blood typing, blood counts, tissue sections, urinalyses, and bacteriological and serological tests. Positions in this field are available in hospital laboratories, physicians' and surgeon's clinics, and in health department laboratories. Medical Technologists also aid in the conduct of research in many medical centers.

Students who are interested in this field should register in the curriculum in Medical Technology. In this program students will take their freshman, sophomore, and junior year's work at the University and their last year's work at the Mary Hitchcock Memorial Hospital School of Medical Technology, Hanover, New Hampshire. After satisfactorily completing the courses at the School of Medical Technology (Microbiology 761-762), the student is awarded 32 credits toward the Bachelor of Science degree. This program also qualifies the student for the examination for the Medical Technologist's certificate administered by the Registry of Medical Technologists of American Society of Clinical Pathologists. Thus a student can obtain the B.S. degree from the University and the M.T. certificate in a four-year period. Students who complete this curriculum are well qualified for work in any hospital or medical laboratory.

At the present time, the fees for the senior year include a University tuition fee of \$50 for New Hampshire residents and \$120 for non-residents and a maintenance fee of \$700 (including room and board) at the Mary Hitchcock Memorial Hospital School of Medical Technology. The latter institution has a stipend program which provides \$600 for students meeting the requirements of this program.

Students in the Medical Technology curriculum must obtain grades of C or better in 24 semester credits from the following courses: Zoology 507-508; Microbiology 503, 702, 705; Chemistry 517, 545; and Biochemistry 756.

Students who in their junior year decide not to take the training program at the Mary Hitchcock Memorial Hospital School of Medical Technology will find it possible to transfer to a major in the Bachelor of Arts Program, such as Microbiology or some other biological science. In such case, they would have to satisfy requirements of the Bachelor of Arts Program.

Students interested in the curriculum in Medical Technology are advised to consult with the supervisor, Professor Theodore G. Metcalf.

## College of Liberal Arts

FRESHMAN YEAR		SEMESTER	CREDITS
P.E. 431-432	Physical Education (Men)	1½	1½
P.E. 401, 402	Physical Education (Women)	1	1
Biol. 405	Principles of Biology		
or		4	
Bot. 411	General Botany		
Zool. 412	Principles of Zoology		4
Chem. 403-404	General Chemistry	4	4
Engl. 401-402	Freshman English	3	3
Math. 407-408	Fundamental Mathematics	3	3
	Electives		

SOPHOMORE YEAR		SEMESTER	CREDITS
P.E. 403, 404	Physical Education (Women)	1	1
Microb. 503	General Microbiology	4	
Microb. 702	Pathogenic Microbiology		4
Chem. 517	Introductory Quantitative Analysis		4
Chem. 545	Organic Chemistry	5	
Hist. 401, 402	Introduction to Contemporary Civilization	3	3
Group D	Humanities	3	3
	Electives		

JUNIOR YEAR		SEMESTER	CREDITS
Bio. Ch. 756	Physiological Chemistry		5
Microb. 705	Immunology and Serology	4	
Zool. 507-508	Mammalian Anatomy and Systemic Physiology	4	4
Group C	Social Sciences	3	3
	Electives		

SENIOR YEAR		SEMESTER	CREDITS
Microb. 761-762	Clinical Laboratory Methods†	16	16

† This course starts about June 20 at the Mary Hitchcock Memorial Hospital School of Medical Technology and includes lecture and laboratory work in microbiology, blood bank and serology, clinical chemistry, hematology, laboratory management and ethics, mycology, parasitology, histology, and clinical microscopy. The credits are awarded in time for graduation in June of the following year after receipt of an official transcript of the grades obtained at the School of Medical Technology and certification by the director of this school and the supervisor of the curriculum that the work has been successfully completed.

### Music Education Curriculum

This curriculum is designed to prepare teachers of music for the public schools. It is based on the demands for teachers possessing sound musicianship and a broad general culture in addition to a specialized preparation in music education. This program is fully accredited by the State Department of Education and complies with standards set up for certification of teachers and supervisors of music in most states. Training for teaching in both the elementary and secondary schools is included in the program. The Department is affiliated with the Music Educators National Conference.

To be admitted to this curriculum the student must give evidence of having a sound musical background. Freshmen must elect Music 421-422 and four credits of Applied Music in their first year program.

A cumulative grade point average of 2.2, a grade point average of 2.5 in all Music courses, and a grade point average of 2.5 in all Education courses including Music-Education 791, 792, are required to be eligible for Education-Music 793, 794, *Supervised Teaching*.

Public school music teachers must maintain a satisfactory standing musically with other professional musicians in the community and should be able to play or sing acceptably. For this reason 16 semester credits in Applied Music are required before graduation. Students will be encouraged to accumulate up to eight semester credits in one instrument or in voice. In addition, all candidates are required to meet minimum standards of performance in piano, voice, a woodwind instrument, a brass instrument, a string instrument, and percussion. Candidates are expected to meet the piano and voice requirements by the end of their junior years. The minimum instrumental standards may be met by special examination, or may be demonstrated during the time the candidate is registered for Applied Music in these instruments. Details of minimum standards of performance may be obtained from the Supervisor of the Music Education curriculum.

Students who are interested should consult with the supervisor, Professor John B. Whitlock.

FRESHMAN YEAR		SEMESTER CREDITS	
P.E. 401, 402	Physical Education (Women)	1	1
P.E. 431-432	Physical Education (Men)	1½	1½
Engl. 401-402	Freshman English	3	3
Hist. 401, 402	Introduction to Contemporary Civilization	3	3
Group B	Natural Sciences	3, 4	3, 4
	Applied Music*	2	2
Mus. 421-422	Theory I	3	3
	Music Laboratory	1	1
	Electives		

# College of Liberal Arts

SOPHOMORE YEAR		SEMESTER	CREDITS
P.E. 403, 404	Physical Education (Women)	1	1
	Applied Music*	2	2
Educ. 481	Education Psych. of Development	3	or 3
Mus. 523-524	Harmony II	2	2
Mus. 521-522	Sightsinging, Ear Training, Dictation II	1	1
Mus. 405-406	Music History and Literature	3	3
Mus. 525-526	Conducting Methods; Band & Orchestra	1	1
	Music Laboratory	1	1
Group C	Social Sciences	3	3
	Electives		
JUNIOR YEAR		SEMESTER	CREDITS
	Applied Music*	3	3
Educ. 757	Principles of Human Learning	3	
Educ. 758	Principles of Teaching		3
Group D	Humanities	3	3
Mus. 725-726	Orchestration and Chorestration	2	2
	Music Laboratory	1	1
Mu.-Ed. 792	Problems in the Teaching of Elementary School Music		3
	Techniques and Methods in:		
Mu.-Ed. 552	Woodwind Instruments, or		3
Mu.-Ed. 553	Brass and Percussion Instruments, or	3	
Mu.-Ed. 751, 752	Choral Music†	3	3
	Electives		
SENIOR YEAR		SEMESTER	CREDITS
	Applied Music*	2	
Educ. 759	Principles of Education	3	
Mu.-Ed. 791	Problems in the Teaching of Secondary School Music	3	
Mu.-Ed. 551	Techniques and Methods in String Instruments†	2	
	Music Laboratory	1	
	Supervised Teaching of:		
Ed.-Mu. 793	Elementary School Music		7
Ed.-Mu. 794	Secondary School Music		7
	Electives		

\* A minimum of 16 semester credits in Applied Music must be offered by students in this curriculum.

† Any combination of three Techniques courses fulfills curriculum requirements.



### Nursing Curriculum

The need for more and better nursing care for all people and for more well-qualified nurses to give such care is both urgent and immediate. More nurses must be educated in colleges and universities if we are to meet our nation's nursing needs. The student interested in nursing as a career is encouraged to consider majoring in Nursing. The graduate of this program will receive a Bachelor of Science degree and will be eligible to take State Board examinations to become a Registered Nurse. Modern nursing offers a great range of job opportunities. Professional nurses are at work wherever the prevention and cure of illness and the promotion of health are of concern. They are members of today's health team working with people from many health fields. If the nurse wants to direct and coordinate nursing as a supervisor or administrator, teach nursing, become a clinical specialist, or do nursing research, she may continue her education to prepare for these positions of responsibility.

The Nursing faculty of the University of New Hampshire will be responsible for the Nursing courses. Learning experiences (nursing laboratory) will be arranged in hospitals in the area, a medical center, public health and other health agencies. Starting with the second semester of the junior year, a calendar year will be devoted to nursing courses including nursing experience. For part of this year it will be necessary for the student to live off campus.

The student will purchase uniforms in the sophomore year at a cost of approximately \$60.00. Other expenses will be the same as for other students. Special scholarships and loans will be available for the students.

Students in the Nursing Curriculum must obtain a grade-point average of 2.2 or better for the accumulative average of the required courses: Zoology 507-508, Psychology 401-402, Nursing 503-504, 602, 610, 621. This curriculum requires 134 credits for graduation.

Students interested in the program are encouraged to talk with the Chairman of the Department of Nursing.

# College of Liberal Arts

FRESHMAN YEAR		SEMESTER	CREDITS
P.E. 431-432	Physical Education (Men)	$\frac{1}{2}$	$\frac{1}{2}$
P.E. 401, 402	Physical Education (Women)	1	1
Engl. 401-402	Freshman English	3	3
Hist. 401, 402	Introduction to Contemporary Civilization	3	3
Biol. 405	Principles of Biology		
or		4	
Bot. 411	General Botany		
Zool. 412	Principles of Zoology		4
Chem. 403-404	General Chemistry	4	4
Nurs. 401-402	Introduction to Nursing	1	1
SOPHOMORE YEAR		SEMESTER	CREDITS
PE. 403, 404	Physical Education (Women)	1	1
Zool. 507-508	Mammalian Anatomy and Systemic Physiology	4	4
Soc. 400	Introductory Sociology		3
Psych. 401-402	General Psychology	3	3
H.E. 425	Child Development	3	
Group D	Humanities	3	3
Nurs. 503-504	Fundamentals of Nursing	3	3
JUNIOR YEAR		SEMESTER	CREDITS
H.E. 783	Family Relationship	3	
H.E. 573	Nutrition	3	
Microb. 503	General Microbiology	4	
Educ. 757	Principles of Human Learning	3	
Nurs. 551	Medical and Surgical Nursing	4	
Nurs. 602	Comprehensive Nursing		14
SUMMER SESSION (8 weeks)		SEMESTER	CREDITS
Nurs. 610	Comprehensive Nursing	6	
SENIOR YEAR		SEMESTER	CREDITS
Nurs. 621	Comprehensive Nursing	14	
Elective	Elective		9
Nurs. 701	Rehabilitation Nursing		4
Nurs. 702	Senior Seminar in Nursing		4

## Occupational Therapy Curriculum

An ally to the medical profession, occupational therapy is any activity, mental or physical, prescribed by a physician and administered by a registered therapist to aid in the recovery or the rehabilitation of the patient.

The successful practice of occupational therapy requires not only thorough academic preparation but also suitable personality combined with judgment, dependability, tact, tolerance, patience, and will to serve. A high degree of mental and physical health is essential. Occupational therapy requires physical vitality and emotional stability.

Both men and women may be admitted if they meet minimum entrance requirements. Minimum requirements include sophomore standing, 2.0 cumulative grade point, Biology 405 (or Botany 411) and Zoology 412, Psychology 401-402, Arts 431, 432, and an approval interview with the department committee\*. The student should also take the series of Occupational Therapy Aptitude Tests in the semester preceding selection of the program. Declaration of this major may be made at the end of the freshman year, or the first semester, sophomore year. Students seeking to transfer to the University of New Hampshire from other accredited collegiate institutions must consult with the department chairman, prior to admission to the curriculum, in order that the applicant may be fully aware of the problems involved in completing the requirements for the degree. Due to the highly specialized nature of the Occupational Therapy curriculum, students are advised to enter the program at the beginning of the sophomore year. In most instances transfer students from other universities require an additional semester in order to meet the requirements for the Bachelor of Science degree.

Students who are registered in the curriculum must obtain grades of C or better in the following courses: Zoology 507, 610, 510; P.E.M. 652; Occupational Therapy 411, 412, 522, 524, 526, 702, 681, 682, 683, 698.

The curriculum in Occupational Therapy is designed to satisfy the American Occupational Therapy Association curriculum requirements, and the Council on Education of the American Medical Association, as well as to offer a four-year course leading to the Bachelor of Science degree. This includes the theoretical subjects needed in medical fields, a wide range of skills and crafts used as therapeutic modalities, as well as preclinical observation of patient treatment under University staff supervision in the junior and senior years.

Following completion of the four-year degree program the student will spend a minimum of nine months in student affiliation in approved A.H.A. hospitals or services under the direction of a registered occupational therapist.

The occupational therapy student is expected to take the nine months' clinical affiliation period in a continuous sequence after receiving his B.S.

degree directly upon receiving his assignments from the director of the curriculum. When this internship is satisfactorily completed, the student is entitled to a Certificate of Occupational Therapy. The student is then qualified to take examination for registry in the American Occupational Therapy Association. The standard examination is sent out by the Association and administered by the University. A fee of \$30.00 is required by the Association for each examination. While the present demand for qualified therapists is far in excess of the supply, there are relatively few opportunities for those who have not completed the requirements for and entered the Registry of the American Occupational Therapy Association.

A student affiliation fee of \$95 for residents of New England and \$200 for non-residents of New England is payable in advance to the University by those students who enter the clinical affiliation program.

The minimum of nine months of student affiliation in approved hospitals is divided as follows:

O.T. 711 General Medicine, Surgery, and Pediatrics — three months

O.T. 712 Psychiatry — three months

O.T. 713 Physical Disabilities and Rehabilitation — three months

The American Medical Association requires a physical examination including a tuberculin test prior to hospital affiliation.

Expenses vary during the period of student affiliation. Room, board, and laundry are usually provided students by the psychiatric hospitals; meals only in other hospitals. In all cases, the University must approve living arrangements for students affiliates. Students will furnish six (6) regulation white uniforms which are required for student affiliation. Students should be prepared to meet all of their living and traveling expenses during the clinical affiliation of nine months. The University does not guarantee maintenance.

Students interested in the curriculum are advised to consult the Chairman of the Department and to attend the several occupational therapy assemblies which occur during the academic year.

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\* Freshmen considering an Occupational Therapy program must follow the freshman program as outlined in the Occupational Therapy Curriculum.

## College of Liberal Arts

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FRESHMAN YEAR		SEMESTER CREDITS	
P.E. 431-432	Physical Education (Men)	$\frac{1}{2}$	$\frac{1}{2}$
P.E. 401, 402	Physical Education (Women)	1	1
Biol. 405	Principles of Biology		
or		4	
Bot. 411	General Botany		
Zool. 412	Principles of Zoology		4
Engl. 401-402	Freshman English	3	3
Hist. 401, 402	Introduction to Contemporary Civilization	3	3
Arts 431, 432	Basic Design; Drawing and Design	2	2
Psych. 401-402	General Psychology	3	3
	Electives		

SOPHOMORE YEAR		SEMESTER CREDITS	
P.E. (403), (404)	Physical Education (Women) (Ele. Games; Rec. Workshop)	1	1
H.E. (425) or	Child Development		
Psych. 537	Developmental Psychology	3	
O.T. 411	Introduction to Occupational Therapy	2	
O.T. 412	Therapeutic Crafts		3
Zool. 510	Functional Anatomy and Neurology		4
Zool. 507	Mammalian Anatomy and Physiology	4	
Zool. 610	Introduction to Pathology		1
Group D	Humanities	3	3
Soc. 400	Introduction to Sociology	3	
O.T. Group II†	Skills (Select 1)		2-3
	Electives		

# College of Liberal Arts

JUNIOR YEAR		SEMESTER	CREDITS
O.T. 515	Therapeutic Crafts, Advanced	3	
O.T. 522	Application of Occupational Therapy in General Medicine		2
O.T. 681	General Medical Lectures	3	
O.T. 682	Orthopedic Medical Lectures		2
Psych. 545	Psychodynamics of Normal and Abnormal Behavior		3
P.E.M. 652	Kinesiology		3
O.T. Groups I and II†	Skills and Techniques (select 3)	6	3
	Social Sciences‡	3	3
	Electives		

SENIOR YEAR		SEMESTER	CREDITS
O.T. Group I*	Skills and Techniques	6	
O.T. 524	Application of Occupational Therapy in Psychiatry		2
O.T. 526	Application of Occupational Therapy in Physical Disabilities	3	
O.T. 683	Medical Lectures, Psychiatry	2	
O.T. 698	Advanced Reading Seminar of Treatment		3
O.T. 702	Administration and Organization		2
	Electives		

## CLINICAL AFFILIATIONS

O.T. 711	General Medicine, Surgery and Pediatrics	no credit
O.T. 712	Psychiatry	no credit
O.T. 713	Physical Disabilities and Rehabilitation	no credit

† O.T. Group I — required crafts as follows: Arts 425, Woodworking, 3 credits; Arts 401, Ceramics, 3 credits; Arts 419, Weaving, 3 credits; and Home Economics 405; Sewing, 3 credits or Occupational Therapy 516, Sewing.

‡ O.T. Group II — skill courses in various departments, selected from an approved list available in the Occupational Therapy office, including The Arts, Home Economics, Business Administration, etc.

§ Social Sciences: Economics 401-402; Geography 401, 402; Political Science 405, 406, 408; any History.



### Physical Education Curriculum for Men

The Physical Education curriculum is offered for students who are interested in preparing themselves for positions in the fields of health and physical education and as coaches of athletic teams. Freshmen who are interested in this curriculum should register for Physical Education 441-442 in lieu of 431-432 and should elect Physical Education 453. Students also may elect and are encouraged to choose courses to broaden their educational scope. Those planning to enter graduate work in this field should elect additional foundation science courses and a foreign language. A cumulative grade point average of 2.2; a grade point average of 2.5 in all Physical Education courses; and a 2.5 average in all Department of Education courses, and including Physical Education 656 and Physical Education-Education 792; are required to be eligible for Education-Physical Education 790, *Directed Teaching of Physical Education*.

In addition to the basic Physical Education Curriculum, an Academic Subject Teaching Option is offered under this curriculum.

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\* A more intensive introduction would be obtained by electing Biology 405 (or Botany 411) and Zoology 412, 4 credits each.

† Students must complete at least six of these theory and applied technique courses and no more than two of the six may be Problems of Coaching: Physical Education 521, *Problems of Coaching Basketball*; Physical Education 522, *Problems of Coaching Football*; Physical Education 553, *Theory of Teaching Dance*; Physical Education 524, *Problems of Coaching Baseball*; Physical Education 525, *Theory of Teaching Team Sports for Men*; Physical Education 526, *Theory of Teaching Individual Sports for Men*; Physical Education 527, *Theory of Teaching Aquatics*; Physical Education 528, *Problems of Coaching Track and Field*; Physical Education 529, *Theory of Teaching Gymnastics and Tumbling*.

# College of Liberal Arts

FRESHMAN YEAR		SEMESTER	CREDITS
P.E. 441-442	Physical Education Activity Courses	1	1
Biol. 401, 402*	Man and the Living World	3	3
Engl. 401-402	Freshman English	3	3
Hist. 401, 402	Introduction to Contemporary Civilization	3	3
P.E. 453	Principles of Physical Education Electives	3	
SOPHOMORE YEAR		SEMESTER	CREDITS
P.E. 443-444	Physical Education Activity Courses	1	1
P.E. 582	Personal and Community Health		2
Educ. 481	An Educational Psychology of Development	3	
Zool. 507-508	Mammalian Anatomy and Systemic Physiology	4	4
P.E. 521; 553; 525; 527; 529 (select one)†		2	
P.E. 522; 524; 526; 528 (select one)†			2
Group D	Humanities Electives	3	3
JUNIOR YEAR		SEMESTER	CREDITS
Educ. 757	Principles of Human Learning	3	
Educ. 759	Principles of Education		3
P.E. 521; 553; 525; 527; 529 (select two)†		4	
P.E. 522; 524; 526; 528 (select one)†			2
P.E. 520	Physiology of Exercise	3	
P.E. 652	Kinesiology		3
P.E. 656	Problems of Health Education		3
Group C	Social Sciences Electives	3	3
SENIOR YEAR		SEMESTER	CREDITS
P.E. 665	Administration of Physical Education in Secondary Schools	3	
P.E. 668	Measurement Procedures in Physical Education		3
P.E.-Ed. 792	Problems of Teaching Physical Education in the Elementary School	3	
P.E. 622	First Aid-Safety; Athletic Training	2	
Ed.-P.E. 790	Directed Teaching of Physical Education		6
P.E. 521; 553; 525; 527; 529 (select one)†		2	
	Electives		

### Physical Education for Men, Academic Subject Teaching Option

The Academic Subject Teaching Option is offered for students who are planning to teach an academic subject in addition to teaching Physical Education and coaching in secondary schools. In this Option there is greater emphasis upon preparation and directed teaching of the elected academic subject. In the freshman year the student takes the same courses as required in the basic Physical Education Curriculum. Students in this Option must be certain to satisfy all course and quality requirements necessary for admission to practice teaching in the selected academic subject. They must consult with the chairmen of the subject-matter department and the Department of Education as early as possible in their academic careers. A cumulative grade point average of 2.2; a grade point average of 2.5 in the academic subject; and a 2.5 average in all education courses, including the — Education 791 course in the academic subject; are required to be eligible for the Education — 794 course in *Supervised Teaching*.

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\* A more intensive introduction would be obtained by electing Biology 405 (or Botany 411) and Zoology 412, 4 credits each.

† Electives approved after consultation with the proper Liberal Arts department must qualify students for supervised teaching in another academic subject.

‡ Students must complete at least four of these courses, not including more than two of the Problems of Coaching courses.

# College of Liberal Arts

FRESHMAN YEAR		SEMESTER	CREDITS
P.E. 441-442	Physical Education Activity Courses	1	1
Biol. 401, 402*	Man and the Living World	3	3
Hist. 401, 402	Introduction to Contemporary Civilization	3	3
Engl. 401-402	Freshman English	3	3
P.E. 453	Principles of Physical Education Electives†	3	

SOPHOMORE YEAR		SEMESTER	CREDITS
P.E. 443-444	Physical Education Activity Courses	1	1
Zool. 507-508	Mammalian Anatomy and Systemic Psysiology	4	4
Educ. 481	An Educational Psychology of Development	3	
P.E. 521; 553; 525; 527; 529	Theory and Applied Technique Courses (select one)‡	2	
P.E. 522; 524; 526; 528	Theory and Applied Technique Courses (select one)‡		2
P.E. 582	Personal and Community Health		2
Group D	Humanities Electives†	3	3

JUNIOR YEAR		SEMESTER	CREDITS
Educ. 757	Principles of Human Learning	3	
Educ. 758	Principles of Teaching		3
Educ. 759	Principles of Education		3
P.E. 520	Physiology of Exercise	3	
P.E. 652	Kinesiology		3
Group C	Social Sciences	3	3
P.E. 521; 553; 525; 527; 529	Theory and Applied Technique Courses (select one)‡	2	
P.E. 522; 524 526; 528	Theory and Applied Technique Courses (select one)‡		2
	Electives†		

SENIOR YEAR		SEMESTER	CREDITS
P.E. 622	First Aid-Safety; Athletic Training	2	
P.E. 665	Administration of Physical Education in Secondary Schools	3	
—Ed. 791	Problems in Teaching the Academic Subject	3	
Ed.— 794	Supervised Teaching of the Academic Subject in the Secondary School Electives†		6 or 14

## Physical Education Curriculum for Women

For women students who plan to prepare themselves for positions as teachers of physical education, the University has organized the Physical Education Curriculum for Women. Furthermore, students have the opportunity, if they so desire, to prepare themselves to teach in a subject-matter field as well as in physical education. The curriculum is open to women who have satisfactorily completed the freshman year and are approved by the Department of Physical Education for Women for admission to that field of concentration. It provides an opportunity for students to teach physical education under supervision, in nearby schools.

Any student in this curriculum who is planning to teach in areas in addition to physical education must complete with an average grade of C or better a second teaching major of 18 semester credits in subjects taught in high schools.

For students in this curriculum, the following courses offered by other departments are suggested as valuable electives: Arts 408, Microbiology 501, Speech 403, Humanities 501-502, Music 403, 404, Psychology 537, Sociology 400, Sociology 560. Physical Education 454 is also recommended. Students are advised to choose non-professional electives whenever possible. Those planning to enter graduate study should elect a foreign language.

A cumulative grade point average of 2.2; a grade point average of 2.5 in all Physical Education courses; and a 2.5 average in all Department of Education courses, and including Physical Education 656 and Physical Education-Education 792, are required to be eligible for Education-Physical Education 790, *Directed Teaching of Physical Education*.

Under Physical Education 411, 412, 421, 422 (freshmen); 413, 414, 423, 424 (sophomore); 415, 416 (juniors) and 417 (seniors), Physical Education curriculum students take sections especially reserved for them. During the four years the student will generally have the following: movement fundamentals, soccer, skiing, lacrosse, swimming, basketball, volleyball, tennis (intermediate), hockey, stunts and tumbling, figure skating, elementary games, folk and square dance, modern dance, badminton, outdoor education, archery, golf, folk and square dancing, modern dance (intermediate), track and field, apparatus and gymnastics.

For those who are highly skilled in the activities mentioned above, substitutions are made with the approval of the supervisor. Further dance and other activities not listed above are included in courses in the curriculum.

Students interested in majoring in Physical Education should consult one of the supervisors, Professor Janet Atwood or Professor Marion C. Beckwith.

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\* Freshmen considering this curriculum should also elect Physical Education 421, 422.

† A more intensive introduction would be obtained by electing Biology 405 and Zoology 412. 4 credits each.

# College of Liberal Arts

FRESHMAN YEAR		SEMESTER	CREDITS
P.E. 411, 412*	Physical Education	1	1
Biol. 401, 402†	Man and the Living World	3	3
Engl. 401-402	Freshman English	3	3
Hist. 401, 402	Introduction to Contemporary Civilization	3	3
P.E. 453	Principles of Physical Education Electives	3	
SOPHOMORE YEAR		SEMESTER	CREDITS
P.E. 413, 414	Physical Education	1	1
P.E. 423, 424	Physical Education	1	1
P.E. 455	Introduction to Community Recreation	3	
Educ. 481	An Educational Psychology of Development	3	
P.E. 554	The Theory of Teaching Dance		2
P.E. 582	Personal and Community Health		2
Zool. 507-508	Mammalian Anatomy and Systemic Physiology	4	4
Group D	Humanities Electives	3	3
JUNIOR YEAR		SEMESTER	CREDITS
P.E. 415, 416	Physical Education	1	1
Educ. 757	Principles of Human Learning	3	
Educ. 759	Principles of Education		3
P.E. 553	The Theory of Teaching Dance	2	
P.E. 520	Physiology of Exercise	3	
P.E. 656	Problems of Health Education		3
P.E. 563, 564	The Theory of Teaching Team Sports	2	2
P.E. 652	Kinesiology		3
Group C	Social Sciences Electives	3	3
SENIOR YEAR		SEMESTER	CREDITS
Ed.-P.E. 790	Directed Teaching of Physical Education		6
P.E. 655	Remedial Gymnastics	3	
P.E. 765	Administration of Physical Education in Secondary Schools	3	
P.E. 668	Measurement Procedures in Physical Education		3
P.E. 573, 574	The Theory of Teaching Individual Sports for Women	2	2
P.E.-Ed. 792	Problems of Teaching Physical Education in the Elementary School Electives	3	



### Recreation and Parks Curriculum

The need for professionally trained recreation and/or park leaders and administrators far outreaches the supply. The men and women graduates in this program will receive a Bachelor of Science degree after successfully completing the following listed requirements. Prior to registering for Physical Education 788, the student must have a cumulative grade point average of 2.2. Permission to enter this curriculum must be obtained from the adviser for recreation and parks.

In addition to the curriculum requirements, the student is encouraged to seek summer or part-time employment with a recreation agency. Camp and playground work are specifically recommended. For further information, contact Professor Patricia Farrell or Professor Robert E. Wear.

FRESHMAN YEAR		SEMESTER	CREDITS
P.E. 411, 412	Physical Education (Women)	1	1
P.E. 441-442	Physical Education (Men)	1/2	1/2
Biol. 401, 402	Man and the Living World	3	3
or Biol. 405	Principles of Biology		
and Zool. 412	Principles of Zoology	4	4
Engl. 401-402	Freshman English	3	3
Hist. 401, 402	Introduction to Contemporary Civilization	3	3
P.E. 453	Principles of Physical Education	3	
P.E. 454	Organized Camping		3
	Electives		

## College of Liberal Arts

SOPHOMORE YEAR		SEMESTER	CREDITS
P.E. 413, 414	Physical Education (Women)	1	1
P.E. 443, 444	Physical Education (Men)	1½	1½
Arts 408	Crafts		3
Econ. 401	Principles of Economics	3	
P.E. 455	Introduction to Community Recreation	3	
P.E. 460	Social Recreation		3
Psych. 401-402	General Psychology	3	3
Zool. 507-508	Mammalian Anatomy and Systemic Physiology	4	4
Group D	Humanities	3	3
	Electives		
JUNIOR YEAR		SEMESTER	CREDITS
Acctg. 502	Financial Accounting		3
Music 403	Introduction to Music Literature	3	
Speech and Drama 403	Speech Communication	3	
Speech and Drama 459*	Stagecraft		3
Pol. Sci. 405†	Elements of Political Science	3	
Soc. 400	Introductory Sociology		3
P.E. 561	Nature Recreation	3	
P.E. 541	Recreation Practicum	1	1
	Electives		
SENIOR YEAR		SEMESTER	CREDITS
P.E. 663	Recreation & Park Administration	3	
P.E. 677	Areas and Facilities Design for Recreation	3	
P.E. 541	Recreation Practicum	1	1
P.E. 788	Recreation Field Work		6
P.E. 798	Recreation Research Seminar		2
P.E. 644	Outdoor Education		3
Pol. Sci. 513	Introduction to State and Local Government	3	
Soc. (500)	Social Psychology	3	
	Electives		

\* Or suitable alternate in Speech and Drama with the permission of the adviser.

† Or Political Science 406 with the adviser's permission.

### Social Service Curriculum

Social Service includes the following fields: state public welfare work; child welfare services; school social work; marital and family counseling; medical, psychiatric, and correctional casework; social group work; community organization; social research; social action and administration.

For full recognition in social service, it is important for a man or woman to have completed the two-year professional course in a graduate school of social work. The best preparation for admission to such a graduate school is either a broad liberal arts education with 40 to 60 hours of credit in the social sciences, including a major in Sociology, or the Social Service curriculum. For able students, scholarship aid toward meeting expenses of graduate study is often available.

There is a continuing serious shortage of qualified workers in nearly all branches of social work. For this reason, a number of students who complete the Social Service curriculum find employment each year, in public welfare, group work, etc. Students registered in it must obtain a grade of C or better in 24 semester hour credits from the following courses: Sociology 520, 500, 703, 621, 622, 701, 702, and 631; and Psychology 402 and 754.

Interested students are advised to consult with the supervisor, Professor Pauline Soukaris, Department of Sociology.

# College of Liberal Arts

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## FRESHMAN YEAR

		SEMESTER	CREDITS
P.E. 401, 402	Physical Education (Women)	1	1
P.E. 431-432	Physical Education (Men)	1/2	1/2
Biol. 401, 402	Man and the Living World	3	3
Engl. 401-402	Freshman English	3	3
Hist. 401, 402	Introduction to Contemporary Civilization	3	3
Soc. 400	Introductory Sociology Electives	3	

## SOPHOMORE YEAR

		SEMESTER	CREDITS
P.E. 403, 404	Physical Education (Women)	1	1
Microb. 501	Public Health and Sanitation	3	
Psych. 401-402	General Psychology	3	3
Soc. 520	The Family	3	
Soc. 500 or Psych. 545	Social Psychology Psychodynamics of Normal and Abnormal Behavior		3
Group D	Humanities Electives	3	3

## JUNIOR YEAR

		SEMESTER	CREDITS
Soc. 703	Criminology	3	
Soc. 621-622	Introduction to Social Welfare	3	3
Group B	Physical Sciences* Electives	4	4

## SENIOR YEAR

		SEMESTER	CREDITS
Psych. 754	Abnormal Psychology		3
Soc. 701-702	Statistics; Social Research	3	3
Soc. 631	Social Welfare Field Experience Electives	6	

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\*Must be satisfied by a Physical Science sequence.

## Bachelor of Music Curriculum

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This professional degree is offered to students who wish to major in applied music and theory and who wish to develop their talent in performance and composition to a high professional standard. The majority of the courses are in Music. Standards of performance are maintained which are the equivalent of those offered by conservatories of music. To be admitted to this program, candidates must demonstrate a flare for performance or strong creative ability, and in the case of applied music, must have had solid prior training in their instrument.

Only freshmen and sophomore students can be accepted in this program in 1967-68. Transfer students must consult with the Chairman of the Music Department before being accepted.

Bachelor of Music Curriculum offers concentrations in the following:

OPTION 1, Piano

OPTION 2, Organ

OPTION 3, Voice

OPTION 4, Strings, woodwinds, brass or percussion

OPTION 5, Theory

### Degree Requirements

These requirements apply to students who enter the College of Liberal Arts between July 1, 1967 and June 30, 1968, and who are seeking a Bachelor of Music Degree.

1. 128 semester-hour credits.
2. At least a 2.0 grade-point average in all courses completed at the University of New Hampshire.
3. All the University Academic Requirements as listed on page 73.
4. Specific Curriculum Requirements as follows. Courses are to be completed generally in the sequence in which they are arranged.

# College of Liberal Arts

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## FRESHMAN YEAR

### FOR ALL OPTIONS

		SEMESTER	CREDITS
P.E. 401-402	Physical Education (Women)	1	1
P.E. 431-432	Physical Education (Men)	1/2	1/2
Engl. 401-402	Freshman English	3	3
Hist. 401-402	Introduction to Contemporary Civilization	3	3
Mu. 421-422	Theory I	3	3
	Electives*		

OPTION 1	Music 570, 6 credits
OPTION 2	Music 571, 6 credits
OPTION 3	Music 573, 6 credits; Music 570, 2 credits; Music Laboratory (choral), 2 credits
OPTION 4	Applied Music (major instrument), 6 credits; Music 570, 2 credits; Music Laboratory (instrumental), 2 credits.
OPTION 5	Music 570, 2 credits

## SOPHOMORE YEAR

### FOR ALL OPTIONS

		SEMESTER	CREDITS
P.E. 403, 404	Physical Education (Women)	1	1
Group B	Natural Sciences	3 or 4	3 or 4
Group C	Social Sciences	3	3
Mu. 521-522	Sightsinging, Ear Training, Dictation II	1	1
Mu. 523-524	Harmony II	2	2
	Electives*		

OPTION 1	Music 570, 6 credits
OPTION 2	Music 571, 6 credits
OPTION 3	Music 573, 6 credits; Music 570, 2 credits; Music Laboratory (choral), 2 credits
OPTION 4	Applied Music (major instrument), 6 credits; Music 570, 2 credits; Music Laboratory (instrumental), 2 credits
OPTION 5	Music 570, 2 credits; Music 405-406, 6 credits; Applied Music (strings), 1 credit, (brasses), 1 credit, (wood- winds), 1 credit

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\* Students must take enough electives to average 16 credits per semester for a total of 128 credits required for graduation.



## College of Liberal Arts

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JUNIOR YEAR		SEMESTER CREDITS
FOR ALL OPTIONS	Foreign Language Selected Electives*	4 4
OPTION 1	Group D (Humanities), 6 credits; Music 570, 6 credits; Music 719-720, 4 credits; Music 405-406, 6 credits; Ensemble, 4 credits.	
OPTION 2	Group D (Humanities), 6 credits; Music 571, 6 credits; Music Laboratory (choral), 2 credits; Music 405-406, 6 credits; Music 719-720, 4 credits; Music 525-526, 2 credits; Performance Class, no credit.	
OPTION 3	Music 573, 6 credits; Music 570, 2 credits; Music 405-406, 6 credits; Music Laboratory (choral), 2 credits; The Art Song, 2 credits; The Lied, 2 credits; Ensemble (vocal), 4 credits. (Italian to be the foreign language.)	
OPTION 4	Applied Music (major instrument), 6 credits; Ensemble (instrumental), 4 credits; Music 405-406, 6 credits; Music 525-526, 2 credits; Music Laboratory (instrumental), 2 credits; Group D (Humanities), 6 credits.	
OPTION 5	Music 719-720, 4 credits; Music 723-724, 4 credits; Music 725-726, 4 credits; Form and Analysis, 4 credits; Music 570, 2 credits; Group D (Humanities), 6 credits.	
SENIOR YEAR		
FOR ALL OPTIONS	Electives*	
OPTION 1	Music 570, 8 credits; Ensemble, 4 credits; Music 709, 710, 4 credits; Form and Analysis, 4 credits; Advanced Music Literature or Theory Courses, 4 credits.	
OPTION 2	Music 573, 4 credits; Music 571, 8 credits; Form and Analysis, 4 credits; Liturgical Music, 2 credits; Organ Literature, 4 credits; Performance Class, 0 credit; Music Laboratory (choral), 2 credits.	
OPTION 3	Music 573, 8 credits; Music 570, 2 credits; Music 707-708, 4 credits; Music Laboratory (choral), 2 credits; French, 4 credits; German, 4 credits; Ensemble (vocal), 4 credits; Form and Analysis, 4 credits. (Group D satisfied by 30 hours in three areas in the Humanities.)	
OPTION 4	Applied Music (major instrument), 8 credits; Form and Analysis, 4 credits; Music 719-720, 4 credits; Music 725-726, 4 credits; Music Laboratory (instrumental), 2 credits. Ensemble (instrumental), 4 credits; Literature of Major Instrument, 4 credits.	
OPTION 5	Music 721-722, 4 credits; Advanced Composition, 4 credits; Music 570, 2 credits; Advanced Music Literature, 2 credits; Music 704, 4 credits. Thesis.	

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# The College of Technology

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~~ROBERT N. FAIMAN,~~

~~Dean~~

JOHN B. HRABA,

Associate Dean

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## Departments

Chemical Engineering

Chemistry

Civil Engineering

Electrical Engineering

Mathematics

Mechanical Engineering

Physics

## Programs of Study

BACHELOR OF SCIENCE:

Engineering:

Chemical Engineering

Civil Engineering

Electrical Engineering

Mechanical Engineering

Science and Mathematics:

Chemistry

Mathematics

Physics

### General Information

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The College of Technology offers its students a vigorous professional education in engineering, the physical sciences, or mathematics. All programs require study in the humanities and social sciences in addition to a thorough grounding in the basic aspects of mathematics, the physical sciences, and specialized studies of the chosen professional area. This pattern of undergraduate work is designed to provide a base either for a successful career in industry or for advanced study at the graduate level.

Since modern technology has drawn engineering applications and their scientific bases more closely together, the engineering curricula are oriented to emphasize the theoretical-scientific aspects of engineering. The importance of the role and responsibility of the engineer or scientist in modern society is emphasized through study in the humanistic-social areas.

#### Degrees

The College of Technology offers the Bachelor of Science degree in each of its departments.

For information concerning advanced degrees, see the Graduate School catalogue.

#### Curricula

Each candidate for a degree must satisfy all general University requirements for graduation, complete at least 128 semester credits, including the courses required in one of the four-year curricula and achieve a minimum grade-point average of 2. (Note: Graduation credit requirements as established by departments may range from 128 to 145).

Curricula of the various departments in the College of Technology are revised and modified as required to reflect the patterns of their professional areas and to provide an effective base for the future professional growth of their graduates. Entering students may anticipate that a curricular program as presented, or as subsequently modified, will permit their graduation in four years, assuming normal loads and progress.

If a break in attendance occurs, or other than normal progress is made, the curricular requirements which must ordinarily be satisfied will be those which are in effect at the time of graduation. Specific programs accomplishing this will be prepared by the student and his adviser for approval by the Executive Committee of the College.

University-wide requirements including Physical Education, History 401-402, and six semester hours each from Groups C and D (see page 73) are a part of each curriculum. In the freshman and sophomore years, male students may elect Basic Air Force or Army ROTC, or substitute six credits of humanistic-social courses. A total of six hours of ROTC credit may be applied to the total required for graduation in all curricula.

### **Honors Program**

The College of Technology, through its various departments, offers the superior student the opportunity to participate in an Honors Program which is individually designed to provide added intellectual incentives and opportunities beyond those offered in the regular curricula. Admission to Honors status is by invitation of the department concerned and with the approval of the Dean of the College. It is limited to those students entering the junior year with at least a 3.0 average.

The program permits the student, with approval of his departmental adviser and the Dean, to develop an individualized plan of study which, within the framework of his chosen professional area, may include appropriate courses from any of the Colleges in the University in lieu of, and/or in addition to, those courses normally prescribed.

### **Dual Degree Programs**

Students may formally combine studies in a professional curriculum in the College of Technology with studies in other curricula of the University. The College of Liberal Arts offers a broad liberal educational experience in a number of major areas or specific curricula in the Whittemore School or the College of Agriculture may be jointly pursued as the basis of preparation for an interdisciplinary career. Normally these joint programs will involve attendance for five years and two Bachelor's degrees will be awarded upon satisfactory completion of the requirements of both areas.

If a student is approved for a dual degree program, initial registration will be in the College of Technology, but an adviser will be assigned from both areas so that an integrated program of study may be planned from the outset in order to accomplish the student's objectives in the most efficient and academically-sound manner.

### **Reserve Officer Training Corp Programs**

Provision is made in each departmental curriculum for students electing to enroll in basic Air Force or Army ROTC. The basic Air Force program requires enrollment in each semester of the freshman and sophomore years. One credit per semester is earned. The basic Army program requires enrollment in Semester I of the freshman year for two credits, Semester II, zero credit, and both semesters of the sophomore year for two credits each. The student should consult his adviser for optimum course arrangements to include ROTC program requirements.

## Chemical Engineering

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O. T. ZIMMERMAN, *Chairman*

Chemical engineering is that branch of engineering which involves the application of chemistry, physics, mathematics, and fundamental engineering principles to the design, construction, and operation of equipment for carrying out chemical processes on an industrial scale at the lowest possible cost. The Chemical Engineering curriculum therefore, provides the student basic training in the physical sciences, engineering principles, and economics.

Although chemical engineering is a distinct profession, chemical engineers are also considered to be members of the chemical profession and a considerable portion of the Chemical Engineering curriculum is devoted to the science of chemistry. However, emphasis is placed upon the large-scale manufacture of chemical products instead of the laboratory phase of chemistry.

A minimum of 141 credits is required for graduation with the degree of Bachelor of Science in Chemical Engineering.

# College of Technology

FRESHMAN YEAR		SEMESTER	CREDITS
P.E. 431, 432	Basic Physical Education	$\frac{1}{2}$	$\frac{1}{2}$
R.O.T.C.	Air Force or Army, or Elective*	( )	( )
Chem. 405-406	General Chemistry	5	5
Engl. 401-402	Freshman English	3	3
Math. 425-426	Calculus A 1 and A 2†	4	4
Phys. 404	General Physics I		4
Tech. 401	Problems in Engineering	3	
SOPHOMORE YEAR			
R.O.T.C.	Air Force or Army, or Elective*	( )	( )
Chem. 547-548	Organic Chemistry	5	5
Ch.E. 511-512	Chemical Engineering Principles I and II	2	2
Hist. 401-402	Introduction to Contemporary Civilization	3	3
Math. 527, 528	Differential Equations and Multidimensional Calculus	4	4
Phys. 501-502	General Physics II and III	4	4
JUNIOR YEAR			
Chem. 683-684	Physical Chemistry	5	5
Ch.E. 613-614	Chemical Engineering Principles III and IV	4	4
Ch.E. 617	Chemical Engineering Principles VI	4	
Ch.E. 622	Chemical Engineering Thermodynamics		4
Elective	University Group C or D	3	3
SENIOR YEAR			
Ch.E. 615	Chemical Engineering Principles V	3	
Ch.E. 631	Chemical Engineering Kinetics	4	
Ch.E. 641	Physical Metallurgy		4
Ch.E. 662	Chemical Engineering Economics and Plant Design		4
Ch.E. 696	Chemical Engineering Project or Approved Technical Elective		3
E.E. 533	Fundamentals of Electrical Engineering	4	
M.E. 523	Mechanics of Solids	4	
Elective	University Group C or D	3	3
Elective	Approved Technical Elective		3

\* See p. 147. Students not electing R.O.T.C. will enroll for six credits of approved electives.

† Students whose College Entrance Examination Board Mathematics Achievement Test score indicates a need for a more gradual approach will enroll in Math. 421-422-523 in place of Math. 425-426.



## Technology Curriculum in Chemistry

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A. R. AMELL, *Chairman*

This curriculum is intended to prepare the student for the career of a professional chemist in industry and to provide a strong foundation for graduate study leading to original and independent research.

Instruction is given by lectures, recitations, and carefully supervised laboratory work. The laboratory study is largely individual and the course work of each student is planned to furnish a broad knowledge of chemical science. The student may elect either German or Russian to enable him to read chemical literature, and he receives a grounding in mathematics and physics necessary for the advanced courses in chemistry. In the senior year, an independent research project is undertaken, permitting the student to use the reference library and chemical periodicals throughout the course of a laboratory investigation.

The minimum credits required for graduation, with the degree of Bachelor of Science in Chemistry, is 132. The student with the assistance of his adviser should plan a program based on the following suggested distribution of courses.

FRESHMAN YEAR		SEMESTER	CREDITS
P.E. 431-432	Basic Physical Education	$\frac{1}{2}$	$\frac{1}{2}$
R.O.T.C.	Air Force or Army, or Elective*	3	3
Chem. 405-406	General Chemistry and Qualitative Analysis	5	5
Engl. 401-402	Freshman English	3	3
Math. 425-426	Calculus A 1 and A 2†	4	4
Phys. 404	General Physics I		4

SOPHOMORE YEAR		SEMESTER	CREDITS
German or Russian 401-402		4	4
Chem. 547, 548	Organic Chemistry	5	5
Physics 501-502	General Physics II and III	4	4
Math. 527	Differential Equations or Approved Elective‡	4	
Math. 528	Multidimensional Calculus or Approved Elective‡		4

JUNIOR YEAR		SEMESTER	CREDITS
Chem. 661-762	Analytical Chemistry	5	5
Chem. 683-684	Physical Chemistry I and II	3	3
Chem. 685-686	Physical Chemistry Laboratory I and II	2	2
Chem. 755	Organic Chemistry	3	
Chem. 756	Qualitative Organic Analysis		3
Chem. 697	Chemical Literature	1	
Electives Group C or D (socio-humanistic)		3	3

SENIOR YEAR		SEMESTER	CREDITS
Chem. 775	Inorganic Chemistry	4	
Chem. 776	Physical Chemistry III		3
Chem. 698	Seminar		1
Chem. 699	Senior Thesis	5	5
Hist. 401-402	Introduction to Contemporary Civilization	3	3
Electives Group C or D (socio-humanistic)		3	3

\* See p. 147. Students not electing R.O.T.C. will enroll for six credits of approved electives.

† Students whose College Entrance Examination Board Mathematics Achievement Test score indicates a need for a more gradual approach will enroll in Math. 421-422-523 in place of Math. 425-426.

‡ In some cases students may wish to take History 401-402 at this time and take Mathematics 527 and 528 (or approved elective) in the senior year.

### Civil Engineering

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J. HAROLD ZOLLER, *Chairman*

The profession of civil engineering, the oldest of the major branches of engineering practice, embraces the functions of planning, design, and construction of buildings, bridges, dams, transportation projects, and public works in general.

The curriculum includes a study of the basic sciences which are essential to the practice of civil engineering, and the application of these principles in the classroom, design room, and laboratory. Additional work is provided in the social-humanistic fields to produce a graduate who is technically competent and well adjusted to his social environment.

The minimum credits required for graduation with the degree of Bachelor of Science in Civil Engineering is 144. The student with the assistance of his adviser should plan a program based on the following suggested distribution of courses which averages 18 credit hours per semester.

# College of Technology

FRESHMAN YEAR		SEMESTER	CREDITS
P.E. 431-432	Basic Physical Education	$\frac{1}{2}$	$\frac{1}{2}$
R.O.T.C.	Air Force or Army or Elective*	( )	( )
Chem. 403-404	General Chemistry	4	4
Engl. 401-402	Freshman English	3	3
Math. 425-426	Calculus†	4	4
M.E. 405	Engineering Drawing	3-0	0-3
Phys. 404 •	General Physics I		4
Tech. 401	Problems in Engineering	3	

SOPHOMORE YEAR		SEMESTER	CREDITS
R.O.T.C.	Air Force or Army or Elective*	( )	( )
C.E. 505-506	Surveying I and II	3	3
Hist. 401, 402	Introduction to Contemporary Civilization	3	3
Math. 527-528	Differential Equations and Multidimensional Calculus	4	4
M.E. 523-524	Mechanics of Solids, Dynamics	4	4
Phys. 501-502	General Physics II and III	4	4

JUNIOR YEAR		SEMESTER	CREDITS
C.E. 517	Engineering Materials	4	
C.E. 620	Transportation Engineering		3
C.E. 642	Fluid Mechanics		4
C.E. 681-685	Theory of Structures I and II	4	4
E.E. 533	Electrical Engineering Fundamentals	4	
Engl. 523	Writing of Technical Reports‡		2
Geol. 407	General Geology‡	2	
M.E. 533	Thermodynamics		3
Elective	University Group C or D	3	3

SENIOR YEAR		SEMESTER	CREDITS
C.E. 643	Water Supply and Treatment	4	
C.E. 644	Sewerage and Sewage Treatment		4
C.E. 665	Soil Mechanics and Foundations	4	
C.E. 692	Steel Design		3
C.E. 693	Reinforced Concrete Design	3	
Approved C.E. Elective		3	3
Approved Elective		( )	(6)
Elective	University Group C or D	3	3

\* See p. 147. Students not electing R.O.T.C. will enroll for six credits of approved electives.

† Students whose College Entrance Examination Board Mathematics Achievement Test score indicates a need for a more gradual approach will enroll in Math. 421-422-523 in place of Math. 425-426.

‡ Or approved elective.

## Electrical Engineering

*G. B. Murdoch - Chairman*

Electrical engineers seek to provide solutions to real problems involving man's needs for the processing of information or for the utilization of electrical power. By conversion of information in audible, visual, digital, thermal, or mechanical form into electrical signals we are able to transmit it over large distances, amplify it, store it, recover it rapidly, perform calculations with extreme precision and speed, or to provide automatic devices for controlling complex operations. By the generation, transmission, distribution, and efficient utilization of electrical power, we are able to provide mankind with his most versatile form of energy.

The essence of engineering is design — the art of economically applying theory and judgment to produce devices, components, and engineering systems. Most design tasks make extensive use of mathematics and basic science, which are emphasized in the first two years of the electrical engineering curriculum. In the third year the student concentrates on engineering science courses, whereas in the fourth year laboratory and application courses which develop experience in the practice of measurement, analysis, and design of electrical devices and systems are emphasized.

Because electrical engineering has been applied so widely to other fields of learning; medicine and business, for example; it is particularly well suited to the dual degree programs described on page 147.

The Electrical Engineering curriculum is intended to prepare the student for further and more specialized studies at the formal or informal graduate level and for immediate employment as an engineer-in-training.

The minimum credits required for graduation in June, 1968, with the degree of Bachelor of Science in Electrical Engineering, is 144; thereafter 140. The student with the assistance of his adviser should plan a program based on the following suggested distribution of courses.

SENIOR YEAR FOR 1968 GRADUATES		SEMESTER CREDITS	
Engl. 523	Writing of Technical Reports		2
E.E. 557, 558	Student Branch I.E.E.E.	0	0
E.E. 525, 526	Electrical Laboratory	2	2
E.E. 645, 646	Electrical Networks, Fields	3	3
M.E. 534	Thermodynamics	3	
M.E. 691	Engineering Economy	3	
Elective	University Group C or D	3	3
Approved Elective‡		( )	( )

# College of Technology

FRESHMAN YEAR		SEMESTER	CREDITS
P.E. 431-432	Basic Physical Education	$\frac{1}{2}$	$\frac{1}{2}$
R.O.T.C.	Air Force or Army, or Elective*	( )	( )
Chem. 403-404	General Chemistry	4	4
Engl. 401-402	Freshman English	3	3
Math. 425-426	Calculus†	4 -	4
M.E. 405	Engineering Drawing	3	
Phys. 404	General Physics I		4
Tech. 401	Problems in Engineering	3	
Group Requirements*			3

SOPHOMORE YEAR		SEMESTER	CREDITS
R.O.T.C.	Air Force or Army, or Elective*	( )	( )
E.E. 501-502	Electrical Circuit Theory I and II	4	4
Hist. 401-402	Introduction to Contemporary Civilization	3	3
Math. 527-528	Differential Equations and Multidimensional Calculus	4	4
M.E. 523-524	Mechanics of Solids, Dynamics	4	4
Phys. 501-502	General Physics I and II	4	4

JUNIOR YEAR		SEMESTER	CREDITS
E.E. 503-510	Electrical Circuit Theory III, Electronic Circuits I	4	4
E.E. 505‡	Electrical Engineering Materials	3	
E.E. 507‡	Electronic Devices	2	
E.E. 509-520	Fields and Waves, Energy Conversion	3	4
E.E. 517-518	Electrical Laboratory I and II	3	3
M.E. 533-536	Thermodynamics, Fluids	3	3
M.E. 539	Mechanical Laboratory		1
Group Requirements*			3

SENIOR YEAR		SEMESTER	CREDITS
E.E. 611	Electronic Circuits II	4	
E.E. 521	Energy Conversion and Control Components	3	
E.E. 519	Electrical Laboratory III	3	
Group Requirements*		3	3
Technical Electives§		3 or 4	3 or 4
Free Elective§			9

\* See p. 147. Students not electing R.O.T.C. will enroll for six credits of approved electives.

† Students whose College Entrance Examination Board Mathematics Achievement Test score indicates a need for a more gradual approach will enroll in Math. 421-422-523 in place of Math. 425-426.

§ Approved by adviser.

‡ Electrical Engineering 505 and 507 are sequential in the same semester.



## Technology Curriculum in Mathematics

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M. E. MUNROE, *Chairman*

The Technology Curriculum in Mathematics consists of a thorough grounding in calculus, followed by advanced work in algebra, analysis, applied mathematics, and geometry. Such a program meets the requirements currently set by graduate schools for admission to graduate study in mathematics. It also furnishes the basic mathematical training required of mathematicians in industry and government.

Modern science continues to increase its demands on the undergraduate mathematics program and the Technology Mathematics curriculum is subject to continual scrutiny and revision in an effort to keep up with these demands. Every effort is made to give the student of mathematics the most up-to-date possible presentation of the basic subject matter in this field.

The minimum credits required for graduation in June, 1968, with the degree of Bachelor of Science in Mathematics, is 128. The student with the assistance of his adviser should plan a program based on the following suggested distribution of courses.

# College of Technology

FRESHMAN YEAR		SEMESTER	CREDITS
P.E. 431, 432	Basic Physical Education	$\frac{1}{2}$	$\frac{1}{2}$
Chem. 403-404	General Chemistry	4	4
Engl. 401-402	Freshman English	3	3
Hist. 401	Introduction to Contemporary Civilization	3	
Math. 425-426	Calculus A 1 and A 2	4	4
Phys. 404	General Physics I		4
R.O.T.C.	Air Force or Army*		
SOPHOMORE YEAR		SEMESTER	CREDITS
Fr. 401	Elementary French	4	
Hist. 402	Introduction to Contemporary Civilization		3
Math. 527-528	Differential Equations and Multidimensional Calculus	4	4
Math 531	Introduction to Set Theory and Number Systems	3	
Math. 542	Probability		3
Phys. 501, 502	General Physics II and III	4	4
Approved Elective		3	3
R.O.T.C.	Air Force or Army*		
JUNIOR YEAR		SEMESTER	CREDITS
Ger. 401-402	Elementary German	4	4
Math. 629	Methods of Applied Mathematics I	4	
Math. 755	Fundamental Concepts of Geometry		3
Math. 761-762	Higher Algebra I and II	3	3
Elective	University Group C or D	3	3
Approved Elective		3	3
SENIOR YEAR		SEMESTER	CREDITS
Math. 784	Introduction to Topology	3	
Math. 788	Complex Analysis		3
Math. 767-768	Real Analysis I and II	3	3
Math. 698	Senior Seminar		3
Elective	University Group C or D	3	3
Approved Elective		6	3

\* See p. 147. Students not electing R.O.T.C. will enroll for six credits of approved electives.

## Mechanical Engineering

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R. W. CORELL, *Chairman*

Mechanical Engineering is a challenging profession encompassing a broad spectrum of activity. It contributes to the research, design, development, and production of aerospace vehicles, underwater vessels, instrumentation systems, nuclear and conventional power plants, and general consumer and industrial products. The profession also makes contributions through more fundamental studies of material behavior, the mechanics of solids and fluids, and energy transformation.

The curriculum in Mechanical Engineering is designed to prepare the prospective graduate either for more advanced studies or for beginning a professional engineering career. To accomplish these objectives, the program of study provides a foundation in the basic physical sciences, mechanics of solids and fluids, thermal sciences, materials science, and design. Flexibility in the curriculum enables the student to gain additional competence in any of these areas, developing his abilities in analysis, experimentation, and engineering design. The curricula includes elective courses in the humanities and social sciences to provide a liberal education.

The program in Mechanical Engineering is further designed to develop the student's creative potential to enable him to meet the increasingly complex needs of industry, government and education, while appreciating the role of technology in a modern society.

The student, with the assistance of his adviser, should plan his program based on the following distribution of courses which averages 16-17 credit hours per semester but totaling not less than 134 credits.

# College of Technology

FRESHMAN YEAR		SEMESTER	CREDITS
P.E. 431, 432	Basic Physical Education	$\frac{1}{2}$	$\frac{1}{2}$
R.O.T.C.	Air Force or Army, or Elective*	( )	( )
Chem. 403-404	General Chemistry	4	4
Engl. 401-402	Freshman English	3	3
Math. 425-426	Calculus†	4	4
M.E. 405	Engineering Drawing	3	
Phys. 404	General Physics I		4
Tech. 401	Problems in Engineering	3	

SOPHOMORE YEAR		SEMESTER	CREDITS
R.O.T.C.	Air Force or Army, or Elective*	( )	( )
Hist. 401-402	Introduction to Contemporary Civilization	3	3
Math. 527-528	Differential Equations and Multidimensional Calculus	4	4
M.E. 523, 524	Mechanics of Solids, Dynamics	4	4
Phys. 501-502	General Physics ‡	4	4
M.E. 522-528	Materials I and II§	3	3

## JUNIOR AND SENIOR YEARS

The student will complete the general departmental requirements which include M.E. 533, 536, 537, E.E. 539, 641 and university wide group requirements. The remaining credits will be chosen, in consultation with a departmental adviser, from courses which will lead to a balanced program in the student's chosen area of interest.

\* See p. 147. Students not electing R.O.T.C. will enroll for six credits of approved electives.

† Students whose College Entrance Examination Board Mathematics Achievement Test score indicates a need for a more gradual approach will enroll in Math. 421-422-523 in place of Math. 425-426.

‡ Upon approval of departmental adviser, Physics 502 may be replaced by Physics 503 or a Physics elective.

§ Area of interest or elective courses may be selected in consultation with a departmental adviser in place of Mechanical Engineering 528.

## Technology Curriculum in Physics

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R. E. HOUSTON, *Chairman*

The Technology Curriculum in Physics offers basic training in fundamentals, supplemented by laboratory work, in the various branches of physics. Opportunity is given in the senior year for experimental investigation in some of the fields of physics under guidance of staff members. Such a curriculum prepares its graduates for basic research in industry, the various government research organizations, or for continued academic study toward advance degrees. The diversified opportunities in physics necessitate a flexible curriculum, enabling the student to supplement his studies in physics with other science and engineering courses.

A minimum of 128 semester hours is required for graduation with a Bachelor of Science degree in Physics. Students entering earlier than September, 1963, must satisfy the 144 credit requirement then in effect adjusted for credit changes in required courses. Departmental advisers should be consulted on specific programs accomplishing this.

## FRESHMAN YEAR

		SEMESTER	CREDITS
P.E. 431, 432	Basic Physical Education	$\frac{1}{2}$	$\frac{1}{2}$
R.O.T.C.	Air Force or Army, or Elective	( )	( )
Chem. 403-404	General Chemistry	4	4
Engl. 401-402	Freshman English	3	3
Math. 425-426	Calculus A 1 and A 2†	4	4
Phys. 404	General Physics I		4

## SOPHOMORE YEAR

		SEMESTER	CREDITS
R.O.T.C.	Air Force or Army, or Elective*	( )	( )
Hist. 401, 402 \	Introduction to Contemporary Civilization	3	3
Math. 527, 528	Differential Equations and Multidimensional Calculus	4	4
Phys. 501-502	General Physics II and III	4	4
Approved Foreign Language		5	5

## JUNIOR AND SENIOR YEARS

To meet the major requirements the student must take Physics 601-602, 503, 703-704, 605-606, 701, 609 or 610, and 607 or 608. (Note that Math 629-630 is a prerequisite for many of these courses.) For those students intending to pursue graduate study, it is advisable to elect physics and mathematics courses beyond the minimum requirements, and German or Russian as the foreign language. A student interested in applied physics should elect courses in electrical and mechanical engineering and chemistry.

\* See p. 147. Students not electing R.O.T.C. will enroll for six credits of approved electives.

† Students whose College Entrance Examination Board Mathematics Achievement Test score indicates a need for a more gradual approach will enroll in Math. 421-422-523 in place of Math. 425-426.



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# The Whittemore School of Business and Economics

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KENNETH J. ROTHWELL,

*Acting Dean*

JAN E. CLEE,

*Dean-elect*

## Curricula

Business Administration

Economics

Hotel Administration

## Programs of Study

BACHELOR OF ARTS:

Economics

BACHELOR OF SCIENCE:

Business Administration

Hotel Administration

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## General Information

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The Whittemore School of Business and Economics was established as a separate degree-granting school at the University of New Hampshire on July 1, 1962.

The basic purpose of the School in its undergraduate curricula is to provide for its students a broad academic background, with professional training in one of the disciplines of business administration, economics, or hotel administration. Undergraduate students are required to take a substantial part of their course work in other colleges of the University.

Although upon graduation a student will have a certain degree of professional competence in the area in which he chooses to concentrate, he will shortly discover that from the point of view of his future development substantial familiarity with a selection of other academic disciplines is desirable. In particular, students will be encouraged to elect courses in the social sciences, mathematics, the natural sciences, the arts, and the humanities. The student who pursues study in the relatively broad curricula of business administration or economics will also find that he is prepared for advanced study at the graduate level in these and related disciplines.

### Requirements for Degrees

The Whittemore School offers the degrees of Bachelor of Arts and Bachelor of Science. Students concentrating in economics will be candidates for the Bachelor of Arts degree, and students concentrating in the other curricula offered by the School will be candidates for the degree of Bachelor of Science. Each candidate for a degree must satisfy all general University requirements for graduation, earn at least 128 semester credits, including the courses required in one of the four-year curricula described below, achieve a minimum grade-point average of 2.0, and achieve a minimum grade point average in his curriculum as prescribed for that program.

The several curricula in the Whittemore School are subject to revision and modification from year to year. Students are subject to and responsible for such changes as they may be introduced. Entering students may anticipate, however, that a curriculum as presented, or as subsequently modified, will permit their graduation in four years, assuming that normal academic loads are carried and normal progress is made.

An undergraduate student entering the School will be required to declare his major not later than the end of his sophomore year. The new catalogue becomes effective on July 1 of each year. For information concerning advanced degrees, see the Graduate School catalogue.

### Independent Study

A junior or senior student in the Whittemore School of Business and Economics may elect to take advantage of the opportunity for independent study. The credit allowed ranges from 6 semester hours for juniors up to

12 semester hours for seniors. To be eligible the student must (a) have a cumulative academic average of 3.0 or better and (b) submit at *least sixty days in advance of registration* a plan for his independent study that has the approval of his adviser, the instructor involved, and the School Executive Committee. The student pursuing an independent-study program must meet all general School requirements. He may petition to submit independent-study credits in whole or in part for required-course credits in the economics curriculum or for elective credits in either of the prescribed curricula.

A student with a superior academic record who pursues an independent-study program for a significant portion of a semester's work may petition to be designated "Whittemore Scholar."

The student taking an independent study program will be assigned a member of the faculty of his major area of concentration as his adviser. It is expected that his program will normally take the form of an independent research paper, although programs calling for another form will be considered. The result of a student's activity under this plan will be judged by three members of the faculty selected by his adviser and the Dean.

### **The Ford Foundation Scholarship Program**

A limited number of juniors each year are selected from those who apply for a special three-year program leading to the B.A. and M.A. degrees in economics. The program is limited to superior students who expect that their chosen vocation shall be teaching at the college level. The regular Whittemore School requirements for the Bachelor of Arts degree and the Graduate School requirements for the Master of Arts degree are basic requirements. In addition, the student is expected to attend special seminars. During the last year of the program he will be assigned to duties as an intern in teaching economics.

### **Minor Program**

A minor is not required in the Economics, Business Administration, and Hotel Administration curricula. A student in any one of these curricula may, however, apply for permission to pursue a minor program of study in any discipline in which sufficient courses are offered at the University. Permission to participate in a minor program may be granted only by the Executive Committee of the School with the concurrence of the particular department involved. Consideration shall be given to the student's major area of concentration and proposed minor before granting such permission. Successful completion of such a program is recorded on a student's academic transcript.

A minor shall comprise at least 18 semester hours in the minor department with grades of C or better in courses which count for major credit.

No more than 6 credits used to satisfy area of concentration requirements shall be used for a minor.

### **Dual Degree Program**

A student may obtain more than one undergraduate degree by completing all the curriculum, departmental, college, scholastic, and other requirements. Anyone interested in such a program of study should confer with the deans of the colleges in which he intends to earn degrees as early in his academic career as possible and, if approved for the program, should expect to work closely with faculty advisers from the colleges involved.

### **University and School Group Requirements**

Course requirements stated below apart from Physical Education requirements shall be considered to fulfill both the School and University academic requirements.

Students admitted to the University for the first time in 1967-68 are required to complete successfully English 401-402, History 401, 402, and Mathematics 407-408\* as well as the indicated semester hours in each of the following groups:

#### **GROUP B (NATURAL SCIENCES)**

Six hours from: Biology 401, 402; Botany 411; Chemistry 401-402, 403-404; Geology 401-402; Physical Science 401-402; Physics 401-402; Zoology 412.

#### **GROUP C (SOCIAL SCIENCES)**

Twelve hours from: Geography 401 or 402; Political Science 405, 406, 408; Psychology 401-402; Sociology 400, 411, 540.

#### **GROUP D (HUMANITIES)**

Twelve hours from: Arts 475, 476; English 513, 514, 515, 516; Humanities 501-502; Music 403-404; Foreign Languages 503-504, 505-506; Language 501, 502; any course in Philosophy; Speech and Drama 431, 436.

All Whittemore School students are required to take Mathematics 411 Computer Orientation, (2 cr.), by the end of the sophomore year. All Business Administration students are required to take Sociology 500 which can be used to fulfill 3 hours in the Group C requirements. Hotel Administration students can meet the Group C requirement by taking 6 hours of the courses listed.

Completion of 30 or more credits in three or more areas in a given group shall satisfy the requirements of that group. Advanced placement with credit in any one of these groups shall satisfy the requirements of that group.

\* Students who do not have the mathematics prerequisites for Mathematics 407-408 must take Mathematics 302 or Mathematics 303 as determined by the Mathematics Department (0 credit) to be eligible for Mathematics 407-408. Mathematics 421, 422, 523 or Mathematics 425, 426 may be accepted as alternatives to the Mathematics 407-408 requirement.

## Curricula

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### **Business Administration**

The Business Administration program has been designed as an integrated program. The student may, in his senior year, undertake a modest amount of specialization in one of the several sub-areas of business, but it is the intent of the program that the graduate shall have a broad education in terms of basic principles, concepts and analytical tools to embark upon a career in management. The objective is to provide the student with the preparation requisite to a business and economic climate characterized by rapid change.

In addition to integrated professional preparation the program provides the student with a good grounding in the liberal arts and sciences. Consequently, the amount of work which the student can take in the major field is limited.

The integrated program is structured so that students take the required courses and business electives in the sequence and at the times specified in the program. The required courses in each semester build upon those that precede. The courses given concurrently are also related and integrated as much as possible. From time to time classes will meet jointly and assignments involving more than one course will be given. The Management Laboratory required of all business administration majors is, in part, provided to make such joint work possible.

Students who contemplate the possibility of transferring into Business Administration are urged to elect Mathematics 407-408 and Economics 401-402 and should attempt to take the other prerequisites in the Sophomore year before attempting to transfer.

Upon graduation students will be qualified either to continue with advanced study in economics or business or to become members of the business community. They will have not only the requisite skills of business management but also a broad academic background, which is becoming increasingly important for business achievement.

Students in this curriculum must obtain a cumulative academic average of 2.0 or better in the required courses in business and economics as listed in the curriculum. Of the required courses in business administration and economics, at least 18 semester credits shall be earned at the University of New Hampshire.

Students in the Business Administration curriculum must elect at least nine hours of Business Administration courses. With the approval of his adviser the student may substitute closely related courses in Economics, Mathematics, Psychology, or Sociology. Students in this program may not elect in excess of 18 semester hours of Business Administration courses.

# Whittemore School

FRESHMAN YEAR		SEMESTER CREDITS	
P.E. 401, 402	Physical Education (Women)	1	1
P.E. 431, 432	Physical Education (Men)	1½	1½
Hist. 401, 402	Introduction to Contemporary Civilization	3	3
Engl. 401, 402	Freshman English	3	3
Econ. 401, 402	Principles of Economics	3	3
Math. 407, 408	Fundamentals of Mathematics	3	3
Group C		3	3
		<hr/>	<hr/>
		16	16
SOPHOMORE YEAR		SEMESTER CREDITS	
P.E. 403, 404	Physical Education (Women)	1	1
Econ. 431, 432	Business and Economic Statistics	3	3
B.A. 502	Financial Accounting		4
Soc. 500	Social Psychology	3	
Math. 411	Computer Orientation	2	
Group B		3 or 4	3 or 4
Group C			3
Group D		3	
	Electives		
		<hr/>	<hr/>
		16	16
JUNIOR YEAR		SEMESTER CREDITS	
B.A. 668	Human Behavior in Organizations	3	
B.A. 607	Managerial Control	3	
B.A. 675	Managerial Economics	3	
B.A. 672	Financial Management		3
B.A. 625	Principles of Marketing		3
B.A. 643	Production Management		3
B.A. 697-698	Management Laboratory	1	1
Group D		3	3
	Electives		
		<hr/>	<hr/>
		16	16
SENIOR YEAR		SEMESTER CREDITS	
B.A. 701	Organizational Concepts and Structures	4	
B.A. 774	Business Policy		4
Group D		3	
B.A.	Elective		
		<hr/>	<hr/>
		16	16



### Economics

Students concentrating in economics will be expected to fulfill the basic requirements set down for general Liberal Arts students, such as the modern language and science requirements. In addition, within their area of concentration they will be able to take, among others, such advanced courses as national income analysis, intermediate economic theory, money and banking, international economics, business and economic statistics, and comparative economic systems.

It should be borne in mind, however, that undergraduate training in economics by no means qualifies a student as a professional economist. Those students who intend to become professional economists should plan on taking a minimum of three years of graduate work in the discipline after they have obtained their Bachelor's degree. Nevertheless, undergraduate training in economics does provide an excellent background for graduate training not only in that discipline but in other related disciplines such as government and law. If a student plans to receive only the Bachelor's degree, he will find that his work in economics will qualify him for many positions in business and government service.

Students in this curriculum are required to complete 30 semester credits in economics with a cumulative academic average of 2.0 or better. Of these 30 semester credits, a minimum of 18 credits must be in courses in economics numbered 601 or higher. Major credit toward the 18 semester hours required in courses numbered 601 or higher will be approved in the case of transfer students only if such courses have been taken as upper division courses, i.e., in the junior or senior year. In addition, of the required courses in economics at least 18 semester credits shall be earned at the University of New Hampshire

Honors work in Economics is available to the qualified student.

#### SPECIAL LANGUAGE REQUIREMENT FOR ECONOMICS MAJORS (B.A. degree):

Proficiency in a foreign language at the level achieved by satisfactory work in a one-year college level course is required of all students. This requirement may be fulfilled by achieving a satisfactory score on College Board tests or by completion of beginning courses in a language at the University of New Hampshire (French 401-402, German 401-402, Italian 401-402, Latin 401-402, Russian 401-402, Spanish 401-402, Greek 401-402.) Students having studied a foreign language for two or three years in high school should be able to achieve a satisfactory score on the College Board tests. Placement in advanced courses in foreign languages by College Board tests or by any other approved procedure, including transfer, satisfies this language requirement. The special language requirement should be satisfied no later than the sophomore year.

# Whittemore School

FRESHMAN YEAR		SEMESTER	CREDITS
P.E. 401, 402	Physical Education (Women)	1	1
P.E. 431, 432	Physical Education (Men)	$\frac{1}{2}$	$\frac{1}{2}$
Engl. 401, 402	Freshman English	3	3
Hist. 401, 402	Introduction to Contemporary Civilization	3	3
Math. 407, 408	Fundamentals of Mathematics	3	3
Group C	Electives		
		16	16
SOPHOMORE YEAR		SEMESTER	CREDITS
P.E. 403, 404	Physical Education (Women)	1	1
Econ. 401, 402	Principles of Economics	3	3
Econ. 431, 432	Business and Economic Statistics	3	3
Math. 411	Computer Orientation	2	
Group B		3 or 4	3 or 4
Group C		3	3
	Electives		
		16	16
JUNIOR YEAR		SEMESTER	CREDITS
Econ. 673	Intermediate Economic Analysis	3	
Econ. 675	National Income Analysis	3	
Group D		3	3
	Electives		
		16	16
SENIOR YEAR		SEMESTER	CREDITS
	Electives: Economics courses 601 and above*	6	6
Group D		3	3
	Electives		
		16	16

\* For 6 credits of electives in economics a student may substitute 6 credits in resource economics (courses numbered above 600) or business administration (courses numbered above 600), with the permission of the Dean.

### Hotel Administration

Students concentrating in Hotel Administration will receive basic preparation for careers in professional management and technical specialist positions in the hotel, motel, club, and institutional food service areas. They will be candidates for a Bachelor of Science degree. To insure that graduates know both the basic skills as well as the broad field of hotel administration, each student is required to complete at least two summers of on-the-job experience. Transfer students and others may satisfy part or all of this practical-experience requirement by presenting evidence of having performed similar work.

Additionally, the program of study will include a substantial amount of work in economics and general business management and other courses outside the particular area of hotel administration in order to insure the students' having as broad a professional background as possible.

Students in the Hotel Administration curriculum must obtain a cumulative academic average of 2.0 or better in the required courses given in the Whittemore School.

FRESHMAN YEAR		SEMESTER	CREDITS
P.E. 401, 402	Physical Education (Women)	1	1
P.E. 431, 432	Physical Education (Men)	$\frac{1}{2}$	$\frac{1}{2}$
Engl. 401, 402	Freshman English	3	3
Hist. 401, 402	Introduction to Contemporary Civilization	3	3
Math. 407, 408	Fundamentals of Mathematics	3	3
Math. 411	Computer Orientation	2	
H.A. 401	Introduction to Hotel Management	2	
H.A. 410	Lectures on Hotel Management		$\frac{1}{2}$
Group C			3
		<hr/>	<hr/>
		16	16

SOPHOMORE YEAR		SEMESTER	CREDITS
P.E. 403, 404	Physical Education (Women)	1	1
Econ. 401, 402	Principles of Economics	3	3
Econ. 431	Business and Economics Statistics	3	
B.A. 502	Financial Accounting		4
H.E. 418	Principles of Food Selection and Preparation		4
H.A. 412	Lectures on Hotel Management		1/2
Group D		3	
	Electives		
		16	16

JUNIOR YEAR		SEMESTER	CREDITS
H.A. 509	Hotel and Restaurant Accounting and Control Systems	3	
B.A. 675	Managerial Economics	3	
B.A. 672	Financial Management		3
B.A. 668	Human Behavior in Organization	3	
H.E. 521	Quantity Foods and Purchasing	4	
H.A. 555	Hotel Operations	3	
H.A. 556	Hotel Engineering Problems		3
H.A. 514	Lectures on Hotel Management		1/2
	Electives		
		16	16

SENIOR YEAR		SEMESTER	CREDITS
H.A. 667	Stewarding and Catering	3	
H.A. 666	Hotel Promotion and Sales		3
H.A. 516	Lectures on Hotel Management		1/2
Group D		3	3
	Electives		
		16	16

#### PRACTICAL EXPERIENCE

To be eligible for graduation a student in the Hotel Administration curriculum must have had approved on-the-job allied work for two summers or satisfy the Department Head that satisfactory equivalent experience has been completed.

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Boston, Massachusetts

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# The Graduate School

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## **Master of Science**

Animal Sciences  
Biochemistry  
Biology  
Botany  
Chemical Engineering  
Chemistry  
Civil Engineering  
Electrical Engineering  
Entomology  
Forest Resources  
Genetics  
Geology  
Home Economics  
Mathematics  
Mechanical Engineering  
Microbiology  
Music Education  
Physics  
Plant Science  
Resource Economics  
Soil and Water Science  
Zoology

## **Master of Arts**

Economics  
English  
French  
German  
History  
Music  
Political Science  
Psychology  
Sociology  
Spanish

## **Master of Arts in Teaching**

Department of Education

## **Master of Science for Teachers**

Chemistry  
English  
French  
German  
Mathematics  
Physics  
Spanish

## **Master of Agricultural Education**

Department of Agricultural Education

## **Master of Business Administration**

Whittemore School of Business and Economics

## **Master of Education**

Department of Education

## **Master of Public Administration**

Department of Political Science

## **Doctor of Philosophy**

Biochemistry  
Botany  
Chemistry  
Genetics  
Mathematics  
Microbiology  
Physics  
Plant Science  
Psychology  
Zoology



## **Graduate School**

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The Graduate School, which has offered instruction since 1903, has for its objective the bringing together of faculty and qualified students in a spirit of scholarship and research. The graduate student is given opportunity to specialize in some field of knowledge, and to develop a maturity of thought and attitude toward his professional field, so that both his professional and his cultural life are enhanced. The work of the Graduate School is under the general direction of the Graduate Faculty. The Dean of the Graduate School is responsible for the administration of the regulations and requirements pertaining to admission, conduct of work, the granting of advanced degrees and other pertinent matters.

### **Assistantships, Scholarships, and Fellowships**

Graduate teaching or research assistantships are available in most departments. These involve part-time work in research and teaching activities or some combination thereof. The University also sponsors tuition scholarships, a UNH Fellowship program available to Ph.D. candidates, and the Alumni Fellowship program available to graduate students in the social sciences and the humanities. There are also a number of fellowship programs sponsored by outside agencies such as National Aeronautics and Space Administration, National Science Foundation, U. S. Office of Education and the U. S. Public Health Service.

### **Further Information**

Detailed information about admission, requirements for degrees, courses, fellowships, scholarships, and assistantships are to be found in the Graduate School catalogue which may be obtained by writing to the Dean of the Graduate School.

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## Description of Courses

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# IBM Key Codes

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The following numbers are used extensively in machine-processed data to identify both undergraduate and graduate programs offered at the University. An asterisk preceding the number identifies those departments which offer graduate programs.

## College of Liberal Arts

- 40 Liberal Arts non-departmental
- 41 Biological Sciences Division
- 42 Education Division
- 43 Humanities Division
- 44 Physical Sciences Division
- 45 Social Sciences Division
- 46 The Arts
- \*47 Microbiology
- \*48 Education
- \*49 English
- 50 Geography
- \*51 Geology
- \*52 Government
- \*53 History
- 55 Foreign Language and Literature
- \*56 French
- \*57 German
- 54 Nursing
- 58 Greek
- 59 Italian
- 60 Latin
- 61 Russian
- \*62 Spanish
- \*63 Music
- 64 Music Education
- 65 Occupational Therapy
- 66 Philosophy
- \*67 Psychology
- \*68 Sociology
- 69 Speech and Drama
- \*70 Zoology

## College of Agriculture

- 20 Agriculture non-departmental
- \*21 Resource Economics
- \*22 Agricultural and Extension Education
- \*23 Soil and Water Science
- \*25 Animal Sciences
- \*26 Biochemistry
- \*27 Botany
- \*29 Entomology
- \*30 Forestry
- \*31 Home Economics
- \*32 Plant Sciences

## College of Technology

- 79 Technology non-departmental
- \*80 Chemical Engineering
- \*81 Chemistry
- \*82 Civil Engineering
- \*83 Electrical Engineering
- \*84 Mathematics
- \*85 Mechanical Engineering
- \*86 Physics

## Whittemore School of Business and Economics

- 74 Hotel Administration
- \*71 Business Administration
- \*72 Economics
- 73 Secretarial Studies

## Separate Departments and Programs

- 90 Men's Physical Education
- 91 Women's Physical Education
- \*97 Genetics Program
- 98 Military Science
- 99 Aerospace Studies

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## Explanation of Arrangement

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The title, in capital letters, and the Arabic numeral designate the particular course. Odd numerals indicate courses normally offered in the first semester; even numerals indicate courses normally offered in the second semester. Numerals enclosed in parentheses indicate that course is repeated in the semester following. Thus course 401 (401) is offered in the first semester and is repeated in the second semester. Parentheses are also used to designate courses out of semester sequence. For example, (404) indicates an even-numbered course offered in the first semester. The course description is followed by the prerequisites, if any, and the number of semester credits the course will count in the total required for graduation. Laboratory periods are usually two and one-half hours in length, lectures either 50 minutes or 80 minutes in length.

NLG following the description indicates that the course carries *no letter grade*, being marked "Cr" for credit, "F" for failure. All courses (unless otherwise marked) are open to students who have passed the prerequisites. An elective course may be given only when there is a minimum of five students registered.

If the course numerals are connected by a hyphen, the first semester, or its equivalent, is a prerequisite to the second semester. If the numerals are separated by a comma, properly qualified students may take the second semester without having had the first.

Students must register for the number of credits or within the range of credits shown in the catalog description of a course.

The system of numeric designation of courses is as follows:

- 200-299 Courses in the Thompson School of Agriculture.
- 300-399 Non-credit courses, e.g., Mathematics 301.
- 400-499 Introductory courses not carrying prerequisites and courses generally falling within University and college requirements.
- 500-599 Intermediate-level courses for undergraduate credit only.
- 600-699 Advanced-level undergraduate courses. Entrance to courses numbered 600 and above normally requires junior standing. (Under some conditions these courses may be taken for graduate credit by non-majors only.)
- 700-799 Advanced-level undergraduate courses. (These courses may be taken for graduate credit.)
- 800-899 Courses which carry graduate credit only. (Descriptions will be found in the Graduate School Catalog.)

**Agriculture (20)**

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DEAN'S OFFICE, *College of Agriculture*

401. INTRODUCTION TO COLLEGE

A non-departmental course offering matters not ordinarily reviewed in other courses of instruction. Attention will be given to selected student rules and regulations, scholarships, campus organizations and facilities, opportunities in agriculture as a science, and to programs of study. Also, federal aid as related to land-grant colleges and universities will be discussed. Mr. Richards. For first semester freshmen in Agriculture. 1 credit. NLG.

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**Agricultural Education (22)**

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WILLIAM H. ANNIS, *Associate Professor and Program Supervisor*; JESSE JAMES, *Associate Professor*

650. PRINCIPLES OF AGRICULTURAL AND EXTENSION EDUCATION

The technical and professional qualifications of teachers of agriculture, county agricultural agents, and 4-H club agents. The history, philosophy, and legislation affecting these programs. Special emphasis will be placed on program planning. Mr. Annis. 3 credits.

651, 652. METHODS OF TEACHING MECHANICS IN VOCATIONAL AGRICULTURE

The organization and presentation of agricultural mechanics, supervision and direction of projects, and the preparation and presentation of demonstrations. The first semester deals with fundamental mechanics skills and the second semester with agricultural machinery maintenance and operational techniques of instruction. Mr. Gilman. Required of majors in Teacher Education curriculum. 1 laboratory, 1 credit.

789. SEMINAR IN AGRICULTURAL EDUCATION

Library and reference work and the preparation of papers for various phases of agricultural education. Mr. Annis. Prerequisite: Supervised Practice or 6 hours in Agricultural Education. 1 credit.

(792). PLANNING FOR TEACHING

The organization of materials of instruction to meet group and individual needs. Techniques of instruction, planning for teaching, the function of consulting committees, working with youth groups, and program evaluation. This course is scheduled concurrently with Agricultural Education 794 and 795. Mr. Annis. Prerequisite: Agricultural Education 650 or permission of instructor. 4 credits.

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## Agricultural Education

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### (794). SUPERVISED PRACTICE

Supervised practice in the specific and related problems of agricultural education. Students will be placed in Vocational Agriculture Centers and County Cooperative Extension Service Centers. Mr. Annis. Prerequisite: Agricultural Education 650 or permission of instructor. 2-11 credits.

### 795. PREPARATION FOR CONDUCTING AND SUPERVISING ADULT EDUCATION PROGRAMS

The techniques of adult education in terms of indentifying needs, program planning, methods of teaching, supervision, and evaluation. Mr. Annis. Prerequisite: Agricultural Education 650 or permission of instructor. 3 credits.

### (796) INVESTIGATIONS IN (1) VOCATIONAL EDUCATION (2) EXTENSION EDUCATION (3) ADULT EDUCATION

An opportunity is provided for a student to study a special problem in one of the areas listed. Elective only after consultation with the instructor in charge. Hours to be arranged. 1-6 credits. May be repeated.

### 798. SUPERVISION AND ADMINISTRATION OF VOCATIONAL EDUCATION

The Federal and State requirements for vocational education programs in the secondary schools. 2-3 credits.

### 799. PHILOSOPHY OF VOCATIONAL EDUCATION

The development of vocational education in the United States with emphasis on the socio-economic influences responsible for its establishment. Its relationship with general education, together with the coordination of instructional programs in the various fields. 2-3 credits.

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## Animal Sciences (25) (Animal, Dairy, Poultry)

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Winthrop C. Skoglund, *Professor and Chairman*; Kenneth S. Morrow, *Professor Emeritus*; Loring V. Tirrell, *Professor Emeritus*; Fred E. Allen, *Professor*; C. Hilton Boynton, *Professor*; Walter M. Collins, *Professor*; Nicholas F. Colovos, *Professor*; William R. Dunlop, *Professor*; Harry A. Keener, *Professor*; Richard C. Ringrose, *Professor*; Alan C. Corbett, *Associate Professor*; Herbert C. Moore, *Associate Professor*; Gerald L. Smith, *Associate Professor*; Samuel C. Smith, *Associate Professor*; Richard G. Strout, *Associate Professor*; Arnold K. Fowler, *Assistant Professor*; James B. Holter, *Assistant Professor*; Joseph T. Riker III, *Assistant Professor*; Janet C. Briggs, *Instructor*

### 401. FUNDAMENTALS OF DAIRYING

A general survey of the dairy industry; the selection, feeding, and management of dairy cattle; the composition and properties of milk and

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other products; dairy manufacturing processes; market milk. Mr. Fowler and Mr. Moore. 2 lectures, 1 laboratory, 3 credits.

### 402. INTRODUCTION TO THE LIVESTOCK INDUSTRY

Origin, history, development, characteristics, and adaptability of the different types of horses, cattle, sheep and swine, with practice in judging. Mr. G. L. Smith. 2 lectures, 1 laboratory, 3 credits.

### 403. POULTRY PRODUCTION

The general principles of poultry science and their practical application. Factors of culling, breeding, housing, feeding, marketing, diseases and parasites, incubation, and management. Mr. Skoglund. 2 lectures, 1 laboratory, 3 credits.

### 405, (405). HORSEMANSHIP

Instruction in riding using University owned Morgans under supervision of a riding instructor. It may be possible for a limited number of students to stable their horses at the University upon proper authorization. Any student wishing to use this course to satisfy an activity requirement in Physical Education for Women will register for Physical Education 401, 402, 403, or 404. Three hours of riding per week for which a fee of \$35.00 per quarter is charged. Mrs. Briggs. 1 credit.

### 501. ANIMAL ANATOMY AND PHYSIOLOGY

The general anatomy and physiology of domestic animals and birds. Mr. Allen. 3 credits.

### 502. ANIMAL DISEASES

The prevention, control, and treatment of the bacterial and parasite diseases of domestic animals. Mr. Allen. Prerequisite: Animal Science 501 or permission of instructor. 3 credits.

### 506. FUNDAMENTALS OF ANIMAL NUTRITION

Scientific principles of nutrition in both ruminants and non-ruminants. Mr. Ringrose. 3 credits.

### 504. MEAT AND ITS PRODUCTS

Slaughtering, meat cutting, curing, and identification of cuts, livestock markets. Trips are taken to packing plants and retail outlets. Mr. G. L. Smith. 2 lectures, 1 laboratory, 3 credits.

### 505. LIGHT HORSE SCIENCE

Origin, history, development, judging, selection, feeding, breeding and management of light horses. Special emphasis will be placed upon saddle-horse selection, the show ring classes, and judging. Horse show management will be discussed. Mr. Riker. 2 lectures, 1 laboratory, 3 credits.

### 507, (507). THE SCIENTIFIC APPROACH TO EQUINE DISCIPLINE

The psychological development, control and education stressing biting,

## Animal Sciences

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longeing, collection. Mrs. Briggs. Prerequisite: Animal Science 405 or equivalent and permission of instructor. 1-3 credits. May be repeated.

### 508. DAIRY BACTERIOLOGY

The application of bacteriology principles to the production and processing of milk and other dairy products. Mr. Moore. 2 lectures, 2 laboratories, 4 credits.

### 509, (510). PRINCIPLES OF JUDGING

The student can specialize in dairy cattle, dairy products, livestock or poultry. The principles of judging and selection of various animals and products. Mr. Boynton, Mr. Moore, Mr. Riker, Mr. Collins. Elective only after consultation with instructor in charge. 1 credit. May be repeated.

### 602. LIVESTOCK MANAGEMENT

Selection, feeding, breeding, management and preparation for the showing of beef cattle, swine, and sheep, with special reference to New England conditions. Mr. G. L. Smith. 2 lectures, 1 laboratory, 3 credits.

### 603. APPLIED ANIMAL NUTRITION

Application of scientific principles of nutrition to practical feed formulation and feeding system for poultry and livestock. Mr. G. L. Smith and other staff members. 2 lectures, 1 laboratory, 3 credits.

### 605. PHYSIOLOGY OF REPRODUCTION

A study of physiology, embryology, endocrinology reproduction and lactation in domestic animals and birds. Mr. Fowler. 2 lectures, 1 laboratory, 3 credits.

### 607. MARKET MILK

The producing, handling and distribution of market milk; dairy farm inspection; control of milk supply. Mr. Moore. 2 lectures, 1 laboratory, 3 credits.

### 608. ICE CREAM, BUTTER, AND CHEESE

The making, handling, and marketing. Mr. Moore. 2 lectures, 1 laboratory, 3 credits. (Alternate years; offered in 1967-68.)

### 609. DAIRY CATTLE BREEDING PRINCIPLES

Purebred dairy cattle, breed history, pedigrees; family lines and methods of outstanding breeders; the application of the principle of genetics to the improvement of dairy cattle herd analysis. Mr. Boynton. 2 lectures, 1 laboratory, 3 credits.

### 610. POULTRY MANAGEMENT

The application of successful business principles to poultry production; study of surveys and production costs. Visits are made to numerous poultry farms in order to study various types of enterprise. Mr. Skoglund. 2 lectures, 1 laboratory, 3 credits. (Alternate years; not offered in 1967-68.)

**612. AVIAN DISEASES**

A survey of the diseases of domestic fowl. Emphasizes the fundamentals of disease control including bacterial, fungus, helminths and protozoan parasites and avian diseases caused by virus entities. Serological tests; virus isolation and propagation in avian embryos and tissue culture will be conducted in the laboratory. Mr. Corbett, Mr. Dunlop, and Mr. Strout. 3 lectures, 1 laboratory, 4 credits. (Alternate years; not offered in 1967-68.)

**697-698. ANIMAL SCIENCES SEMINAR**

A survey of recent literature and research in the Animal Sciences. Staff. 1 credit. May be repeated.

**703. ANIMAL GENETICS**

Mendelian and quantitative inheritance in animals; principles and systems of selection. Prerequisite: 3 credits of genetics or permission of instructor. Mr. Collins. 2 lectures, 1 laboratory, 3 credits.

**708. ADVANCED DAIRY SCIENCE**

Basic data, fundamental observations, and discussions of research contributing to the present status of the dairy industry. Mr. Moore. Prerequisite: Adequate preparation in chemistry and bacteriology. 2 credits. (Alternate years; not offered in 1967-68.)

**710. DAIRY CATTLE NUTRITION AND MANAGEMENT**

Feeding and management of dairy animals, calf feeding; raising young stock, and feeding for economical milk production. Mr. Holter. 2 lectures, 1 laboratory, 3 credits.

**711-712. INVESTIGATIONS IN DAIRY, LIVESTOCK, POULTRY**

1. GENETICS: Mr. G. L. Smith, Mr. Collins, Mr. Boynton.
2. NUTRITION: Mr. G. L. Smith, Mr. Ringrose, Mr. Colovos, Mr. Holter.
3. MANAGEMENT: Mr. G. L. Smith, Mr. Skoglund, Mr. Boynton, Mr. Riker.
4. DISEASES: Mr. Allen, Mr. Corbett, Mr. Dunlop, Mr. Strout, Mr. S. C. Smith, Mr. Beckman.
5. PRODUCTS: Mr. G. L. Smith, Mr. Moore.
6. LIGHT HORSEMANSHIP: Mr. Riker, Mrs. Briggs.
7. PHYSIOLOGY: Mr. Fowler, Mr. Riker.

An opportunity is given for the student to select a special problem in any of the fields listed under the guidance of the instructor. Elective only after consultation with the instructor in charge. Hours to be arranged. 1-3 credits. May be repeated.

## The Arts (46)

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George R. Thomas, *Professor and Chairman*; John W. Hatch, *Professor*; John Laurent, *Associate Professor*; Winifred Clark Shaw, *Associate Professor*; James A. Fasanelli, *Associate Professor*; Richard D. Merritt, *Assistant Professor*; Alfred R. Potter, *Assistant Professor*; Daniel L. Valenza, *Assistant Professor*; Dirk Bach, *Instructor*; Arthur Balderacchi, *Instructor*; David May, *Instructor*; Jayne Dwyer, *Instructor*; Ruth Trappan, *Instructor*; Charles F. Chamberlain, *Instructor*; Robert A. McDonald, *Instructor*

The Department of The Arts presents a series of changing exhibitions in the galleries in Paul Creative Arts Center, the Exhibition Corridor in Hewitt Hall, and the Memorial Union. Within a convenient radius of Durham are located a number of the country's important collections of art which students are encouraged to visit. Among these are: the Addison Gallery of American Art, the Currier Gallery of Art, the DeCordova and Dana Museum, the Lamont Gallery, several excellent museums and galleries in Boston, including the Museum of Fine Arts, the Gardner Museum, the Fogg Museum of Harvard University, and the Institute of Contemporary Art.

An experimental art laboratory, the *Student Workshop*, is located in Hewitt Hall and is open to any student in the University, whether or not enrolled in art courses. This laboratory provides an excellent environment in which a student may explore materials, plan and execute projects of his own choice. Excellent facilities, including equipment ranging from small craft tools to industrial type machines, are available.

In those art courses where the student retains the finished work, he pays the cost of materials and supplies used. The University reserves the right to choose to exhibit a student's work for a period of not more than two years.

Students are responsible for the care of shops, studios, and all equipment therein; damage resulting through negligence or carelessness will be the responsibility of the student. Tools and other equipment will not be used until instruction in their use is given by the member of the staff in charge. Unless specifically authorized by the Chairman of the Department, projects not a part of the instructional program must be excluded from the studios.

### Courses in the Crafts

#### 401, 402. CERAMICS, INTRODUCTORY COIL AND SLAB

The basic methods of coil and slab construction to explore three dimensional forms in clay; introduction to glaze material experimentation, glazing, decoration techniques, and stacking and firing of gas and electric kilns. Mr. Potter. Elective by permission of instructor. 2 laboratories, 3 credits. Course fee for materials, \$10.00.



403, 404. CERAMICS, INTRODUCTORY POTTER'S WHEEL

The fundamentals in the traditional use of the potter's wheel; introduction to glaze material experimentation, glazing, decorative techniques, and stacking and firing of gas and electric kilns. Mr. Potter. Elective by permission of instructor. 2 laboratories, 3 credits. Course fee for materials, \$10.00.

407. CRAFTS

Structural and decorative design for craft projects using paper, wood, fabric, metal, leather, etc., which may be used in elementary and secondary schools. Leather work will be emphasized. Mrs. Shaw. *For Art-Education students*; also elective by permission of instructor. 2 laboratories, 3 credits. Course fee for materials, \$7.00.

408. CRAFTS

Structural and decorative design for craft projects using paper, wood, fabric, metal, and natural materials. These craft activities may be used in summer camps, playgrounds, settlement and scout groups. Silk screen printing will be emphasized. Mrs. Shaw. *For Recreation and Parks, Physical Education, and Social Service students*; also elective by permission of instructor. 2 laboratories, 3 credits. Course fee for materials, \$7.00.

413, 414. JEWELRY AND METALSMITHING

Structural and decorative design and construction of jewelry, flatware and hollow ware using sterling silver, copper, brass, pewter. The skills of soldering, polishing, chasing, stone setting, casting, raising, forming are included. A unit in enameling on copper is part of the first semester course. Mrs. Shaw. Elective by permission of instructor. 2 laboratories, 3 credits. Course fee for materials, \$9.00.

419. WEAVING

An introductory course in hand weaving, using the 4-harness loom. Plain and twill weaves, hand pattern techniques, 4-harness patterns for fabric and rug samples and projects using cotton, linen, wool, rayon, etc. Mrs. Shaw. Elective by permission of instructor. 2 laboratories, 3 credits. Course fee for materials, \$10.00.

425, 426. WOODWORKING

A basic course in wood, stressing design and techniques in hand and machine work. Projects range from small carvings and turnings to major pieces of furniture. Techniques include veneering and solid wood joinery. Mr. Valenza. Elective by permission of instructor. 1 lecture, 2 laboratories, 3 credits. Course fee for materials, \$7.00 for Arts 425, \$15.00 for Arts 426.

501, 502. CERAMICS, INTERMEDIATE COIL AND SLAB

Methods of hand construction employed as a means of development of personal creative expression in clay. Specific projects assigned on an



individual basis. Extensive glaze and decorative techniques are explored. Prerequisite: Arts 401, 402. Elective by permission of instructor. Mr. Potter. 2 laboratories, 3 credits. Course fee for materials, \$10.00.

### 503, 504. CERAMICS, INTERMEDIATE POTTER'S WHEEL

Problems dealing with the refinement of form, emphasis upon individual development of style, attitude or philosophy of ceramics. Extensive glaze and decorative techniques are explored. Prerequisite: Arts 403, 404. Elective by permission of instructor. Mr. Potter. 2 laboratories, 3 credits. Course fee for materials, \$10.00.

### 505. GLAZE CALCULATION

Explanation of glaze chemicals and glaze formulation. The methods employed in calculation of particular color and textural affects in stoneware glazes for gas and electric kilns are explored and problems assigned. Prerequisite: Arts 401, 402 or 403, 404. Elective by permission of instructor. Mr. Potter. 1 lecture, 2 laboratories, 3 credits. Course fee for materials, \$5.00. (Alternate years; not offered in 1967-68.)

### 513-514. INTERMEDIATE JEWELRY AND METALSMITHING

Structural and decorative design and construction of jewelry, flatware, and hollow ware. Emphasis placed on raising and fabricating metal for hollow ware. Prerequisite: Arts 414. Elective by permission of instructor. Mrs. Shaw. 2 laboratories, 3 credits. Course fee for materials.

### 520. INTERMEDIATE WEAVING

A study of traditional 4-harness patterns. Fabric designs are based on patterns but modified for contemporary use. Pile rug weaves studied. Prerequisite: Arts 419. Elective by permission of instructor. Mrs. Shaw. 2 laboratories, 3 credits. Course fee for materials.

### 525-526. INTERMEDIATE WOODWORKING AND FURNITURE DESIGN

The major areas dealt with in this course will be storage and seating problems, design and construction. A sound knowledge of woodworking techniques will be required of the student who elects this course. Elective by permission of the instructor. Prerequisite: Arts 425, 426. Mr. Valenza. 1-hour lecture and 6-hour laboratories per week, 4 credits. Course fee for materials.

### 600. CRAFTS WORKSHOP

Students in ceramics, jewelry and metalsmithing, weaving, or woodworking may select one of these areas for advanced studio work. Mrs. Shaw, Mr. Valenza, Mr. Potter. Prerequisite: Arts 413-414; Arts 419, 520; Arts 425-426; or Arts 401, 402, 403, 404; and permission of instructor. Laboratories as arranged. 6 credits maximum. Course fee for materials (varies).

## **Courses in Painting and Graphics, Sculpture, Architecture**

### **431, 432. BASIC DESIGN AND DRAWING**

An introduction to two- and three-dimensional design and drawing. Elective by permission from department office. Mr. Hatch, Mr. Laurent, Miss Dwyer, Mr. Balderacchi, Mr. May, Mr. Bach. 2 laboratories, 2 credits. Arts 432 course fee for materials, \$3.00. No credit toward a major.

### **451. PHOTOGRAPHY**

The theory and practice of photography, covering camera operation, developing, printing, and enlarging. Creative solutions are sought to problems which are designed to increase the students' perception. Mr. Merritt. Elective by permission of instructor. 1 lecture, 1 laboratory, 3 credits. Course fee for materials will approximate \$12.50.

### **455. DRAFTING AND ARCHITECTURAL DESIGN**

Basic drafting procedures, including lettering. Study of architectural symbols and interpretation of architectural plans. Problems of architectural design with emphasis on space utilization and space planning. Mr. Thomas. Elective by permission of instructor. 1 lecture, 2 laboratories, 3 credits.

### **457. SCULPTURE**

Experimentation with three dimensional forms in clay, wood, stone, and metal as media for sculpture. The use of carving chisels, pneumatic tools and welding torch to either cut down or to build up compositions. The development of form, of volume, and of rhythm in space. Mr. Balderacchi. Elective by permission of instructor. 2 laboratories, 3 credits. Course fee for materials, \$10.00.

### **536. GRAPHIC ARTS**

Expression and experimentation in a variety of graphic techniques, i.e., linoleum and wood block printing, etching, lithography, etc., in black and white and color. Mr. Laurent. Elective by permission of instructor. 2 laboratories, 3 credits. Course fee for materials, \$8.00.

### **538. GRAPHIC DESIGN AND ILLUSTRATION**

Design problems in various media and techniques emphasizing the fundamentals of typography, the conception and execution of illustrations, and printing processes and methods of reproduction. Mr. May. Elective by permission of instructor. 2 laboratories, 3 credits.

### **541, 542. ADVANCED DRAWING AND PAINTING**

Drawing is concentrated in the fall semester; extensive drawing in studio and from nature, still life and figure drawing in a variety of media, i.e., pencil, pen, ink and wash, pastel, and watercolor. An introduction to oil painting composition, means of form description, and theories of color are presented in studio exercises and outdoor sketching in the spring

semester. Mr. Hatch, Mr. Laurent, and Mr. Bach. Elective by permission of instructor. 2 laboratories, 3 credits.

### 544. WATER MEDIA

A studio course dealing with various water media, transparent and opaque. Projects will stress the handling of watercolor and casein. Inks, temperas, and polyvinal will also be introduced. Mr. Hatch. Prerequisite: Arts 431 (or equivalent) and permission of the instructor. 2 laboratories, 3 credits.

### 554. ADVANCED PHOTOGRAPHY

The basic theory and practice of color photography. Advanced projects in black and white. Techniques of creative photography including studio and laboratory controls. A portfolio of photographs, representative of the student's progress during the course, will be required. Mr. Merritt. Elective by permission of instructor or department chairman. 1 lecture, 1 laboratory, 3 credits. Course fee for materials will approximate \$25.00.

### 558. INTERMEDIATE SCULPTURE

A continuation of Arts 457 with special emphasis in producing sculpture in non-ferrous metals through direct metal and cast-metal techniques. Independent experimentation and study. An inquiry into the origins of sculpture and an investigation of contemporary sculpture. Prerequisite: Arts 457. Elective by permission of instructor. Mr. Balderacchi. 2 laboratories, 3 credits. Course fee for materials, \$10.00. (Alternate years; offered in 1967-68.)

### 643, 644. ADVANCED PAINTING AND COMPOSITION

An extension of Arts 541 and 542 stressing further development in the various media. Figure study and outdoor sketching also will be included. This course may be taken a second time with emphasis on the particular need of the individual. Mr. Laurent. Elective by permission of instructor. Laboratories as arranged. 3 credits.

### 650. STUDIO WORKSHOP

A course in painting, drawing, photography and print-making designed to subject the advanced student to an intensive experience in these four disciplines. This course is required for graduation in the painting and graphics option. Prerequisite: Arts 451, 536, 541, 542, and permission of instructor. 4 laboratories; 6 credits. Course fee for materials, \$20.50.

### 789. PROBLEMS IN THE VISUAL ARTS

Advanced students may select a special problem in one of the visual arts in which they have exhibited proficiency, to be developed by means of conferences and studio work. Mr. Thomas and staff. Prerequisite: Permission of department chairman. Credits to be arranged. *This course may be repeated to a total of not more than 6 credits.*

## Courses in History of Art

### 475, 476. INTRODUCTION TO THE ARTS

A broad historical survey of man's creative efforts in their relation to contemporary cultural and social movements, presented as a background for interpreting the place of the arts in individual and community life of today. Illustrated lectures with assigned readings. Mr. Thomas and Mr. Fasanelli. 3 credits. *Not open to freshmen. No credit toward a major.*

### 583. PRIMITIVE AND ORIENTAL ART

An inquiry into the origins of art in pre-history, an investigation of the art of selected primitive cultures, and a study of Oriental Art concentrating on the pictorial development of China and Japan. This course is primarily concerned with the evolution of pictorial and sculptural images essentially foreign to the classic western tradition. Mr. Hatch. 3 credits. (Alternate years; not offered in 1967-68.)

### 585. AMERICAN ARCHITECTURE

A chronological survey of architecture in the United States from earliest Colonial times to the present. Architectural field trips in New Hampshire, Massachusetts, and Maine. Mr. Thomas. 3 credits. (Alternate years; offered in 1967-68.)

### 586. AMERICAN ART

A chronological survey of painting, sculpture, and the decorative arts of the United States from earliest Colonial times to the mid-20th Century. Museum visits in New Hampshire and Massachusetts. Mr. Thomas. 3 credits. (Alternate years; not offered in 1967-68.)

### 588. MODERN ART

From Louis XVI to Picasso; traces the history of painting through the various revolutions, political and aesthetic, that resulted in the many schools of thought prevalent in 19th and 20th Century art, i.e., classicism impressionism, cubism, etc. Illustrated lectures with assigned readings. Mr. Fasanelli. 3 credits.

### 682. CLASSICAL ART

A survey of the monuments in Greece and Rome covering the following periods: archaic, classical and Hellenistic in Greece, and the areas influenced by Greek culture; late Republican and Imperial Rome. Significant works from about the mid-18th Century B.C. to the 2nd and 3rd Centuries A.D. are analyzed chronologically. A comprehensive picture of the classical achievement, primarily in architecture and sculpture, and modern debts to the past. Mr. Fasanelli. 3 credits. (Offered in 1967-68.)

### 684. MEDIEVAL ART

A survey of the vast material of the Middle Ages, from the 1st and 2nd Centuries A.D. to the 14th Century, covering architecture, sculpture,

mosaics, manuscripts, and the minor arts. The transitional character of this vast period will be stressed, as well as its dependence upon the antique past. Architecture and the more minor arts will be accented. Mr. Fasanelli. 3 credits. (Alternate years; not offered in 1967-68.)

### 685. THE ART OF THE RENAISSANCE

A historic survey of the achievements of Western civilization in sculpture, painting, and architecture from the Gothic cathedral to the 18th Century drawing room. Illustrated lectures with assigned readings. Mr. Fasanelli. 3 credits. (Alternate years; offered in 1967-68.)

### 686. NORTHERN PAINTING

The development of painting in Flanders, France, and Germany from the late 14th to the early 15th Century. French manuscripts, Flemish painting in the 15th Century, extant French monumental painting, German painting in the 15th Century, and the dependence of this body of material on Flemish developments, as well as Italian. Mr. Fasanelli. 3 credits. (Alternate years; offered in 1967-68.)

### 687. BAROQUE ART

An advanced course surveying architecture, sculpture, and paintings in the countries of western Europe in the 17th and 18th Centuries. The problem of the "Baroque" and the difficulty of defining an international style at a moment when national identities are strong. It is a companion to Arts (685), but is differently oriented. Mr. Fasanelli. 3 credits. (Alternate years; not offered in 1967-68.)

### (797). SEMINAR IN ART HISTORY

Students electing to major in the history option must take this course at least once. The prerequisite is the completion of some work in any one of the survey courses offered in the option in the history of art. The seminar's aims are to direct further work in some area already studied. Introduction to advanced problems of a bibliographical, critical, and iconographical nature. The results of research are required in a formal paper. Mr. Fasanelli. 3 credits.

## Courses in Art Education

### ART-EDUCATION 493. AN INTRODUCTION TO ART EDUCATION

An introductory course designed to provide the student interested in the teaching of art with an understanding of the philosophies, the problems, and the organization of an art program in the schools. Lecture, discussion, and studio. Prerequisite: Arts 431 or permission of the instructor. Miss Dwyer. 2 credits. Course fee for materials.

### ART-EDUCATION 791. PROBLEMS OF TEACHING ART IN SECONDARY SCHOOLS

The purpose and objectives of teaching art in the secondary schools; selection and organization of teaching materials; teaching techniques which



may be advantageously employed in the secondary-school art program. Miss Trappan. Prerequisite: Education 758 with a grade of C or better. 2 lectures, 1 laboratory, 3 credits.

### ART-EDUCATION 792. PROBLEMS OF TEACHING ART IN ELEMENTARY SCHOOLS

The purposes and objectives of teaching art in elementary schools; selection and organization of teaching materials; teaching techniques which may be advantageously employed in the elementary schools. Miss Trappan. Prerequisite: Education 758 with grade of C or better. 2 lectures, 1 laboratory, 3 credits.

### EDUCATION-ART 794. SUPERVISED TEACHING IN ART

Prerequisite: Art-Education 791, 792, and other prerequisites listed under Education. One semester of supervised teaching. 14 credits.

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## Biochemistry (26)

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Edward J. Herbst, *Professor and Chairman*; Thomas G. Phillips, *Professor Emeritus*; Stanley R. Shimer, *Professor Emeritus*; Arthur E. Teeri, *Professor*; Miyoshi Ikawa, *Professor*; Douglas G. Routley, *Associate Professor*; Samuel C. Smith, *Associate Professor*; Gerald L. Klippenstein, *Assistant Professor*

### 501. BIOLOGICAL CHEMISTRY

An introduction to biological chemistry. Mr. Teeri. Prerequisite: Chemistry 402 or 404. 3 lectures, 2 laboratories, 5 credits.

### 695, 696. INVESTIGATION IN BIOCHEMISTRY

Introduction to biochemical investigations. Staff. Subject matter and hours to be arranged. 1-3 credits.

### 699. SENIOR THESIS

Participation in research in biochemistry. For seniors majoring in biochemistry who have completed Biochemistry 751. Staff. 3 credits.

### 751. GENERAL BIOCHEMISTRY

The fundamental principles of biochemistry with emphasis on the chemical properties, principal metabolic pathways, and functions of carbohydrates, lipids and nitrogenous compounds. Mr. Herbst and Mr. Ikawa. Prerequisite: Satisfactory preparation in organic chemistry and quantitative analysis. 3 lectures, 2 laboratories, 5 credits.

### 756. PHYSIOLOGICAL CHEMISTRY AND NUTRITION

An introductory biochemistry course with emphasis on human physiological chemistry and nutrition. The laboratory includes a study of procedures basic to chemical methods used in medical diagnostic work. Mr.



## Biochemistry

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Teeri. Prerequisite: Satisfactory preparation in organic chemistry. 3 lectures, 2 laboratories, 5 credits.

### 762. PLANT METABOLISM

The function, occurrence, synthesis, and degradation of plant constituents. Major emphasis will be placed on respiration and photosynthesis and their relationships to the metabolism of lipids and nitrogen compounds. Mr. Routley. Prerequisite: Biochemistry 751 or 756 or equivalent. 2 lectures, 1 laboratory, 3 credits.

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## Biology (41)

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### 401, 402. MAN AND THE LIVING WORLD

A basic course in biology, designed to give the student fundamental facts about himself and an understanding of his relation to the living world, both plant and animal, of which he is a part. 3 credits. *No credit toward a major.*

### 405. PRINCIPLES OF BIOLOGY

A consideration of the fundamental phenomena of life, with emphasis on cellular biology, genetics, ecology, evolution, and the plant kingdom. This course is an alternate prerequisite for Zoology 412 for students in the College of Liberal Arts. Mr. Borrer. 3 lectures, 1 laboratory, 4 credits.

### BIOLOGY-EDUCATION 791. PROBLEMS IN THE TEACHING OF HIGH-SCHOOL BIOLOGY

Objectives and methods of teaching. The selection and organization of materials; preparation of visual aids; setting up of aquaria and other projects. The use of the field trip as a tool in teaching high school biology. Mr. Schaefer. Prerequisite: Two years of biological science and Education 758 with a grade of C or better. 2 lectures, 1 laboratory, 3 credits.

### EDUCATION-BIOLOGY 794. SUPERVISED TEACHING OF HIGH-SCHOOL BIOLOGY

See description and prerequisites under Education.

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## Botany (27)

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Albion R. Hodgdon, *Professor and Chairman*; Marion E. Mills, *Assistant Professor Emerita*; M. C. Richards, *Professor*; Avery E. Rich, *Professor*; Stuart Dunn, *Professor*; Charlotte G. Nast, *Professor*; Richard Schreiber, *Associate Professor*; Alex L. Shigo, *Adjunct Associate Professor*; Arthur C. Mathieson, *Assistant Professor*

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**411. GENERAL BOTANY**

An introduction to plant science. The evolution of structure and function in the plant kingdom. Required as a prerequisite for Zoology 412. Mr. Schreiber. 3 lectures, 1 laboratory, 4 credits.

**503. THE PLANT WORLD**

A survey of the plant kingdom from an evolutionary point of view. The structure and function of plant parts. Miss Nast. Prerequisite: Biology 401 or Botany 411. 1 lecture, 2 laboratories, 4 credits.

**506. SYSTEMATIC BOTANY**

The identification and classification of our native trees, shrubs, and wild flowers. Mr. Hodgdon. Prerequisite: Biology 401 or Botany 411. 1 lecture, 2 laboratories, 3 credits.

**742. PLANT ECOLOGY**

Plant life and its environment, including a consideration of the principal environment factors, such as light, temperature, soil, water, and biotic relations; study of associations, successions, and plant forms; a survey of plant distribution and underlying causes. Mr. Hodgdon. Prerequisite: Botany 411 or Botany 503. 3 credits.

**751. PLANT PATHOLOGY**

The nature of disease in plants, the etiology, symptomatology, and classification of plant diseases. Mr. Rich. Prerequisite: Botany 411 or Botany 503. 1 lecture, 2 laboratories, 3 credits.

**752. PRINCIPLES OF PLANT DISEASE CONTROL**

Exclusion, eradication, protection, and immunization, and the specific, practical methods used to control plant diseases. Mr. Rich. Prerequisite: Botany 751. 1 lecture, 2 laboratories, 3 credits. (Alternate years; offered in 1967-68.)

**758. PLANT ANATOMY**

The anatomy of vascular plants with special emphasis upon tissue development and structure. Miss Nast. Prerequisite: Botany 411 or Botany 503. 2 lectures, 2 laboratories, 4 credits.

**754. CYTOLOGY**

The structure, physiological behavior, and development of cells. The cellular basis of heredity. Mr. Schreiber. Prerequisite: a year each in the biological sciences and in chemistry. 3 credits.

**755. ADVANCED SYSTEMATIC BOTANY**

The principles and laws of plant classification and nomenclature: study of plant families, field and herbarium work. Mr. Hodgdon. Prerequisite: Botany 506. Hours to be arranged. 3 credits. (Not offered in 1967-68.)

## 756. PLANT PHYSIOLOGY

Structure and properties of cells, tissues, and organs; absorption and movement of water; metabolism; growth and irritability. Mr. Dunn. Prerequisite: Botany 411 or Botany 503, and one year of chemistry. 2 lectures, 2 laboratories, 4 credits.

## 759. INTRODUCTION TO BIOLOGICAL OCEANOGRAPHY AND MARINE ECOLOGY

The distribution, abundance, and growth of marine plants in relation to their environment (chemical, physical, and biological). Mr. Mathieson. Prerequisite: Botany 780, Zoology 715, or permission of instructor. 2 lectures, 1 laboratory, 3 credits.

## 762. MORPHOLOGY OF THE VASCULAR PLANTS

The life histories and evolution of the extinct and living Pteridophytes, Gymnosperms, and Angiosperms, including comparisons of general structure and sexual organs. Miss Nast. Prerequisite: Botany 411 or Botany 503. 2 lectures, 2 laboratories, 4 credits. (Alternate years; not offered in 1967-68.)

## 765. MICROTECHNIQUE

A methods course in embedding, sectioning, and staining plant tissues, and introduction to microscopy. Miss Nast. Prerequisite: Botany 411 or Botany 503. 3 credits. (Not offered in 1967-68.)

## 767. FRESHWATER PHYCOLOGY

Identification, classification, ecology, and life histories of the major groups of freshwater algae. Mr. Mathieson. Prerequisite: Botany 411 or Botany 503. 2 lectures, 2 laboratories, 4 credits. (Alternate years; not offered in 1967-68.)

## 768. MYCOLOGY

Studies of the parasitic and saprophytic fungi, their growth, reproduction, and identification. Mr. Richards. 1 lecture, 2 laboratories, 3 credits.

## 780. MARINE PHYCOLOGY

Identification, classification, ecology and life histories of the major groups of marine algae. Particular emphasis will be placed upon the New England marine algal flora. Mr. Mathieson. Prerequisite: Botany 411 or Botany 503. 2 lectures, 2 laboratories, 4 credits.

## 795, 796. INVESTIGATIONS IN: (1) SYSTEMATIC BOTANY (2) PLANT PHYSIOLOGY (3) PLANT PATHOLOGY (4) PLANT ANATOMY AND MORPHOLOGY (5) PLANT ECOLOGY (6) AQUATIC PLANTS (7) CYTOLOGY (8) PHYCOLOGY

Elective only upon consultation with the department chairman. Mr. Hodgdon, Mr. Dunn, Mr. Rich, Miss Nast, Mr. Schreiber, and Mr. Mathieson. Hours to be arranged. 2 to 6 credits.

## 797, 798. BOTANY SEMINAR

Library and reference work and the preparation of papers and abstracts

on special phases of botany. Practice in the preparation of oral and written reports. Botany staff. Prerequisite: six hours of botany or permission of the department chairman. This course may be repeated for credit. 1 credit.

### 880. ADVANCED MARINE PHYCOLOGY

Classification, ecology, and life histories of marine algae considered at an advanced level. Seminars, discussions, assigned reading, and laboratory. Mr. Mathieson. Prerequisite: Botany 780 or its equivalent. 3 or 4 credits. (Alternate years; offered in 1967-68.)

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## Business Administration (71)

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Arthur W. Johnson, *Professor Emeritus*; Carroll M. Degler, *Professor*; John A. Beckett, *Professor*; Dwight R. Ladd, *Professor*; Herman Gadon, *Associate Professor*; Donald C. Marschner, *Associate Professor*; Allan J. Braff, *Associate Professor*; Robin D. Willits, *Associate Professor*; John J. Korbel, *Associate Professor*; Dwayne Wrightsman, *Assistant Professor*; Menakshisunder Venkatesan, *Assistant Professor*; James O. Horrigan, *Assistant Professor*; Allan R. Cohen, *Visiting Assistant Professor*; C. Stevenson Rowley, *Assistant Professor*; Surendra S. Singhvi, *Instructor*; Joseph E. Michael, Jr., *Lecturer*

### 502. FINANCIAL ACCOUNTING

A general introduction to the objective, theories, conventions, and processes for portraying and communicating the financial status and progress of the business enterprise. Mr. Ladd. Not open to students who have had Business Administration 401-402 or 405. 4 credits.

### 607. MANAGERIAL CONTROL

This course is designed to acquaint the student with the principles, theory, and practice of control in business enterprise. Concentrates on controls internal to a given business but includes controls imposed upon it by its economic, political, and other environments. Includes computer-oriented business games. Mr. Beckett. Prerequisite: permission of the instructor. Not open to students who have had Business Administration 508. 3 credits.

### 621-622. COMMERCIAL LAW

The law of contracts, agency, sales, negotiable instruments, partnerships, and corporations. Mr. Michael. Open to juniors and seniors. 3 credits.

### 625, (625). MARKETING

A study of the marketing behavior of the firm as it supplies goods and services to consumers and industrial users. Attention is paid to the op-

## Business Administration

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timal blending of the ingredients in the "marketing mix," including product design, product line policies, packaging, branding, pricing, promotion, and selection of the channels of distribution. Mr. Marschner. Prerequisite: Economics 402. Not open to students who have had Business Administration 525. 3 credits.

### (643). PRODUCTION MANAGEMENT

Principles of production organization, product design, materials acquisition, layout, production engineering, mechanization, production scheduling, and control. Prerequisite: Economics 402 and 431. 3 credits.

### 658. INVESTMENTS

The problems of investment; investment characteristics of stocks and bonds; public utility, railroad, industrial, and government securities; protection of the investor; investment banking; and related problems. Mr. Degler. Prerequisite: Economics 402. 3 credits.

### 668. HUMAN BEHAVIOR IN ORGANIZATIONS

To provide students with an understanding of relevant behavioral science concepts and the opportunity to apply them. Class time is used on case study, simulation, and an examination of the structure and process of the class itself. Mr. Gadon. 3 credits.

### 672. FINANCIAL MANAGEMENT

A study of the firm's uses and sources of funds with emphasis on working capital management, capital budgeting, and the administration of debt and equity. Mr. Wrightsman. Prerequisite: Economics 402 and Business Administration 502. 3 credits.

### 675 (675). MANAGERIAL ECONOMICS

Concepts and procedures for the analysis and use of cost and revenue data in making business decisions. Make or buy, product policy, pricing, and capital expenditure analysis are given special attention. Mr. Ladd. Prerequisite: Economics 402. 3 credits.

### 695-696. INDEPENDENT STUDY

Individual study projects of special interest and benefit to the student. Permission to pursue an independent study project is required from the student's adviser, proposed project instructor, and the Executive Committee. Permission will be granted only to students who have demonstrated superior scholastic achievement. 3-12 credits per semester.

### 697-698. MANAGEMENT LABORATORY

Through participation in simulations, field trips, cross course assignments, etc., the Management Laboratory will provide an opportunity for the integration of the several business courses taken concurrently. Limited to and required of all Business Administration students in both semesters of the junior year. 1 credit. NLG



### 701. ORGANIZATIONAL CONCEPTS AND STRUCTURES

A theoretical examination of organizations drawing upon literature in the social sciences. Consideration is given to such aspects of organizational behavior as conflict management, patterns of leadership styles, reward structures in formal organizations, goal determination, and the management of change. Several theoretical orientations are compared. Mr. Willits. Prerequisite: Senior standing and permission of instructor. 4 credits.

### (725). BUSINESS HISTORY

A survey of the development of business enterprise and its institutions in Western Europe and the United States from the late Middle Ages to the era of the giant diversified corporations. Emphasis is placed on the role of the entrepreneur, the impact of public policy on business, and the case study of individual firms. Mr. Greenleaf. 3 credits. (This course is the same as Economics 725 and History 725.)

### 727. TRANSPORTATION

Economics of transportation. Competitive characteristics of the several modes of transport. National transportation policy. Limited consideration of transportation as a function of business. Mr. Ladd. Prerequisite: Economics 402 or permission of instructor. 3 credits.

### 747. ADVERTISING AND PROMOTION

How the modern firm employs advertising and other promotional tools to help solve marketing problems with special emphasis on advertising as a medium of communications and as a social-cultural force in the western world. Mr. Marschner. Prerequisite: Business Administration 625. 3 credits.

### 750. ADVANCED MARKETING MANAGEMENT

A study of the interrelation of marketing with production and finance. Topics include planning and developing the product, testing, brand management, packaging, sales organization, forecasting, and control. Policy formulation and decision making. Mr. Marschner. 3 credits.

### 752. MARKETING RESEARCH

The study of marketing research as a basis for formulating marketing policies and strategy. Topics include research design, methods of collecting data, planning the investigation, sampling methods, motivation research, advertising research, and consumer research. Mr. Venkatesan. Prerequisite: Business Administration 625. 3 credits.

### 753. COMPARATIVE MARKETING

Analysis of marketing in planned and free economies. Emphasis on marketing activities, institutions, and marketing problems of Europe, Latin America, Asia, and Africa. Survey and case studies of marketing in economic development, and the possibility of exporting "marketing



"know-how". Mr. Venketesan. Prerequisite: Permission of instructor. 3 credits.

### 756. FEDERAL TAXATION

Current federal income, estate, and gift taxes and their impact on corporations, partnerships, and individuals. Permission of instructor. 3 credits.

### 758. INVESTMENTS ANALYSIS

An evaluation of capital markets and of analytical techniques useful for security appraisal. The following subjects will be covered: securities characteristics; market institutions; yield structures; price change patterns; intrinsic value analysis; investment timing; and portfolio management. Lectures, outside readings, and security analysis research projects are the main tools of the course. Mr. Horrigan. Prerequisite: Business Administration 502 or permission of instructor. 3 credits.

### 761. CONTROL AND INFORMATION SYSTEMS

The concepts of systems, their use in enterprise management, and the role and influence of on-line control systems; the nature and uses of information in management. The course includes materials intended to familiarize the student with information theory and technology. Mr. Beckett. 3 credits.

### 762. COST AND MANAGEMENT

The effective use of cost accounting, cost analysis, and budgeting in planning and controlling operations. Topics considered include analysis of cost behavior, direct and absorption costing, cost-price-volume relationships, distribution costs, transfer pricing, and capital expenditure analysis. 3 credits.

### 763, 764. ADVANCED FINANCIAL ACCOUNTING I AND II

Accounting theory and practice as they contribute to the significance and limitations of the financial statements by which business communicates financial status to interested outsiders. Mr. Horrigan. Permission of instructor. 3 credits.

### 771. CORPORATIONS

The role of the modern corporation in the economy. Emphasis upon structure of the corporation, the corporate system, combinations, and concentration. Mr. Degler. Prerequisite: Economics 402. 3 credits.

### 774. BUSINESS POLICY

Administrative practice of business management; use of business tools; processes of integrating operations, administering business systems, selecting goals and objectives, and formulating policy. Mr. Beckett. Prerequisite: senior standing and permission of instructor. 4 credits.

### 775. OPERATIONS RESEARCH

Mathematical programming, game theory, inventory, queuing, and scheduling problems; dynamic programming. Mr. Korbel. 3 credits.

### 776. CONSUMER BEHAVIOR

The consumer-firm relationship studied in terms of concepts drawn from contemporary social science findings, particularly small group studies, as related to present and prospective marketing activities of a business organization. Mr. Venkatesan. 3 credits.

### 790. SEMINAR IN BUSINESS PROBLEMS

Special topics in business administration. This course may be repeated. Prerequisite: Consent of the adviser and the instructor. Credits to be arranged.

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## Chemical Engineering (80)

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Oswald T. Zimmerman, *Professor and Chairman*; Irvin Lavine, *Professor Emeritus*; Stephen S. T. Fan, *Associate Professor*; David H. Chittenden, *Assistant Professor*; Henry M. Gehrhardt, *Assistant Professor*; Charles B. Schriver, *Assistant Professor*; Yin-Chao Yen, *Adjunct Associate Professor*

### 511. CHEMICAL ENGINEERING PRINCIPLES I

The presentation and interpretation of engineering data; an introduction to systems of units, dimensional analysis, and heat and material balances. 2 credits.

### 512. CHEMICAL ENGINEERING PRINCIPLES II

A study of chemical equilibrium and heats of reaction needed to describe systems undergoing chemical change; an intensive treatment of heat and material balances on complex systems. 2 credits.

### 613. CHEMICAL ENGINEERING PRINCIPLES III

Transport phenomenon and stage operations. The equations of change as a basis for the study of molecular and turbulent transport of momentum, energy and mass, with emphasis upon the relation between the transport mechanism and the mathematical expression. Design principles and procedures for stagewise operations in various co-current and counter-current arrangements, based upon the ideal stage concept. Problems in both steady state and non-steady state operations. 3 lectures, 1 laboratory, 4 credits.

### 614. CHEMICAL ENGINEERING PRINCIPLES IV

Analysis of unit operations. Study of chemical engineering systems, with emphasis on the unit operations involved. Extension of previous studies

## Chemical Engineering

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of unit operations, and treatment of operations not previously considered. 3 lectures, 1 laboratory, 4 credits.

### 615. CHEMICAL ENGINEERING PRINCIPLES V

Correlated with 613-614, this course presents a unified theoretical treatment of momentum, heat, and mass transfer in steady state. 3 credits.

### 617. CHEMICAL ENGINEERING PRINCIPLES VI

Mathematical techniques in chemical engineering applications; problem set-up emphasized; analytical, numerical and statistical methods; digital and analog computations of complex chemical engineering problems. 3 lectures, 1 laboratory, 4 credits.

### 622. CHEMICAL ENGINEERING THERMODYNAMICS

The thermal properties of matter; the first law; the second law; useful thermodynamic functions; behavior of ideal and real gases and liquids; volumetric and phase behavior; cycles; steady flow processes; compression of gases; refrigeration and liquefaction of gases. 3 lectures, 1 recitation, 4 credits.

### 631. CHEMICAL ENGINEERING KINETICS

Chemical kinetics, catalysis, and introduction to reactor design. Study of types of kinetic behavior in chemical processes; prediction of reaction rates in batch and flow reactors with and without catalysis; and application to reactor design. 3 lectures, 1 laboratory, 4 credits.

### 641. PHYSICAL METALLURGY

An introductory study of the nature of metals, emphasizing the quantum mechanical description of the solid state and including atomic structure, bonding, historical development of metal theories, elementary zone or band theory, and X-ray diffraction. The microscopic metal system is also considered, and thermodynamics of metallurgical processes, defects and dislocations, phase relations of pure metals and alloys, microstructure and physical and thermal treatment of metals are discussed. Study of some non-metals is also included. 3 lectures; 1 laboratory, 4 credits.

### 662. CHEMICAL ENGINEERING ECONOMICS AND PLANT DESIGN

The principles of cost engineering, including estimation of plant investment, working capital, operating costs, labor requirements, payout time and profitability, value of money, capitalized costs, simple and compound interest, depreciation, taxes and insurance, labor requirements, overhead, financing of chemical enterprises, design of equipment and plants for minimum cost, plant location, transportation, sales cost, equipment cost, and cost indexes. Each class selects one or more problems involving the complete design of a chemical plant. For each problem, the most desirable process must be determined, the site selected, the equipment and plant designed, calculations made for all costs, profitability and payout

time, and a complete report prepared, including the drawings of equipment and plant layout. 1 lecture, 3 laboratories, 4 credits.

#### 695. CHEMICAL ENGINEERING PROJECT

Each student selects a research problem which he carries out independently under faculty supervision. Intensive study in both the library and the laboratory and a satisfactory report upon completion of the work are required. 3 laboratories, 3 credits.

#### 696. INDEPENDENT STUDY

Individual study projects in various areas of chemical engineering as determined to be of particular interest and value to the student. Permission of the student's adviser and Department Chairman are required; and permission will be granted only to those students who have proved their ability by superior scholastic achievement. 2 to 4 credits.

#### 752. PROCESS DYNAMICS

A basic treatment of process dynamics including a study of first and second order linear processes and their response to step and sinusoidal driving functions. Graphical analysis of the entire control system is included with special emphasis on the optimum design of a stable system. 3 credits.

#### 781. HIGH POLYMERS

Principles and practice of high polymer manufacture, including industrial polymerization methods and equipment design. Laboratory work includes typical polymerization reactions and the physical and chemical testing of various types of plastics and synthetic fibers. 2 lectures, 1 laboratory, 3 credits.

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## Chemistry (81)

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Alexander R. Amell, *Professor and Chairman*; Harold A. Iddles, *Professor Emeritus*; Albert F. Daggett, *Professor*; Helmut M. Haendler, *Professor*; Robert E. Lyle, Jr., *Professor*; Paul R. Jones, *Professor*; Charles M. Wheeler, Jr., *Associate Professor*; Frank L. Pilar, *Associate Professor*; Albert K. Sawyer, *Associate Professor*; Gloria G. Lyle, *Associate Professor*; Kenneth K. Andersen, *Associate Professor*; David W. Ellis, *Associate Professor*; Charles W. Owens, *Assistant Professor*; James H. Weber, *Assistant Professor*; J. John Uebel, *Assistant Professor*; Charles V. Berney, *Assistant Professor*; James D. Morrison, *Assistant Professor*

#### 401-402. GENERAL CHEMISTRY

Elementary chemistry with lecture demonstrations and laboratory practice. Topics of interest to the professional student and of general interest are presented. For agriculture and home economics students and as an

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## Chemistry

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elective. 3 lectures, 1 laboratory, 4 credits. Cannot be used as prerequisite for other chemistry courses without permission.

### 403-404. GENERAL CHEMISTRY

The fundamental laws and conceptions of chemistry, including a study of the nonmetals and metals and their compounds. The theoretical principles are illustrated by lecture demonstrations, and the applications of chemistry in the professions are explained. For students who plan to take further courses in the Department of Chemistry. 2 lectures, 1 recitation, 1 laboratory, 4 credits.

### 405-406. INORGANIC CHEMISTRY

General inorganic chemistry, including qualitative analysis. The preparation of secondary school chemistry will furnish a basis for a thorough course for chemistry majors and others who may elect the course. Mr. Sawyer and assistants. 3 lectures, 2 laboratories, 5 credits.

### 517. QUANTITATIVE ANALYSIS

An introductory course in quantitative analysis including gravimetric, volumetric and instrumental methods, for those students desiring a brief terminal course in analytical chemistry. Mr. Ellis and assistants. Prerequisite: Chemistry 404. 2 lectures, 2 laboratories, 4 credits.

### 521. SEMIMICRO QUALITATIVE ANALYSIS

The application of basic solution theory to ionic equilibrium and to the reactions of qualitative analysis. Problem work is required. The laboratory work provides experience in the application of theory to the analysis of simple and complex inorganic substances. Prerequisite: Chemistry 404. 2 lectures, 2 laboratories, 4 credits.

### 545. ORGANIC CHEMISTRY

An introductory but comprehensive study of the chemistry of carbon compounds with emphasis on the particular phases of the subject needed by students preparing to be technicians, nurses, majors in biological sciences, and others, where a brief course is desired. Prerequisite: Chemistry 404 or 406. Elective for medical technology, nursing, and pre-dental students and majors in botany. 3 lectures, 2 laboratories, 5 credits. Cannot be taken for credit by students taking either Chemistry 547 or 651.

### 547-548. ORGANIC CHEMISTRY

The principal classes of organic compounds, aliphatic and aromatic, with emphasis on class reactions and structural theory. Laboratory exercises in the preparation and purification of selected organic compounds; also the use of group reactions for the identification of organic substances in a systematic scheme of qualitative organic analysis. Mr. Jones, Mr. Andersen, and assistants. Prerequisite: Chemistry 404 or 406, or permission of instructor. 3 lectures, 2 laboratories, 5 credits. Students electing Chemistry 547 cannot take Chemistry 545 for credit.



**651-652. ORGANIC CHEMISTRY**

The principal classes of organic compounds, aliphatic and aromatic, with emphasis on class reactions and structural theory. Laboratory exercises in the preparation and purification of selected organic compounds. Mr. Andersen and assistants. Prerequisite: Chemistry 404 or 406, or permission of instructor. 3 lectures, 2 laboratories, 5 credits. Students electing Chemistry 651 cannot take Chemistry 545 for credit.

**661. ANALYTICAL CHEMISTRY**

A thorough treatment of the theory and techniques of gravimetric and volumetric analysis followed by special methods of analysis, such as ion exchange and EDTA titrations. Prerequisite: Chemistry 405-406 or equivalent. 3 lectures, 2 laboratories, 5 credits.

**663. INTRODUCTORY RADIOCHEMICAL TECHNIQUES**

Radiochemical techniques and laboratory practice in the use of apparatus in many fields of science which utilize radio-chemical operations. Prerequisite: general inorganic chemistry and general physics. 3 lectures, 2 laboratories, 5 credits.

**683-684. PHYSICAL CHEMISTRY I, II**

The properties of gases, liquids, and solids; thermochemistry and thermodynamics; solutions, chemical equilibria, reaction rates, conductance, and electromotive force. Mr. Wheeler. Prerequisite: Mathematics 523 or 426 and Physics. Undergraduates must register for Chemistry 685-686 concurrently. 3 lectures, 3 credits.

**685-686. PHYSICAL CHEMISTRY LABORATORY**

Experimental work illustrating the principles of chemistry. Emphasis is upon the measurement of thermodynamic properties, chemical kinetics and methods of determining the structure of matter. Prerequisite: Mathematics 523 or 426 and physics. Must be taken concurrently with Chemistry 683-684. 2 laboratories, 2 credits.

**696. INDEPENDENT STUDY**

With the consent of the adviser and the departmental chairman, an exceptional student may enroll in a course of independent study. This may consist of individual reading, writing, or laboratory work, which will be carried out under the tutelage of a faculty member. The course may be used to replace specific required courses in chemistry, with approval of the adviser and department chairman. Credits to be arranged.

**697. CHEMICAL LITERATURE**

The use of the chemical library as a research tool. Prerequisite: Chemistry 548 or 652. 1 credit.

**698. SEMINAR**

Student reports on topics of interest. Prerequisite: Chemistry 548 or 652 and 684. 1 credit.



### 699. THESIS

The related background and experimental observation of the year's investigation in some selected subject is required. Members of the staff. For seniors in chemistry who have completed Chemistry 548, 762, 684, and having a grade point average of 2.5, or permission of adviser and department chairman. 5 laboratories, 5 credits.

### 755. ADVANCED ORGANIC CHEMISTRY

The preparation of organic compounds is studied with consideration being given to structural and stereochemical control of the reactions from a knowledge of the mechanism of the reaction. Emphasis is on the solution of assigned problems. Prerequisite: One year of organic chemistry and physical chemistry or permission of instructor. 3 credits.

### 756. CHARACTERIZATION OF ORGANIC COMPOUNDS

The spectroscopic and chemical properties of organic compounds provide a basis for the systematic characterization of organic structures. Methods for the separation of mixtures of organic compounds are considered. Mr. Lyle and assistants. Prerequisite: One year of organic chemistry. 1 lecture, 2 laboratories, 3 credits.

### 762. INSTRUMENTAL ANALYSIS

A treatment of the theory, instrumentation and application of methods such as emission spectrography, flame spectrometry, spectrophotometry, gas chromatography, coulometry, potentionmetry, conductimetry, and polarography to chemical analysis. Prerequisite: Chemistry 661; Chemistry 684 or concurrent registration; or permission of instructor. 3 lectures, 2 laboratories, 5 credits.

### 775. INORGANIC CHEMISTRY

The relationship between chemical reactions and modern concepts of inorganic chemistry on a moderate level. The applicability and limitations of the newer ideas. Mr. Haendler or Mr. Weber. Prerequisite: Chemistry 683-684 or permission of instructor. 3 lectures, 1 laboratory, 4 credits.

### 776. PHYSICAL CHEMISTRY III

Introduction to quantum theory; spectroscopy; chemical bonding; statistical thermodynamics. Prerequisite: Chemistry 683. 3 credits.

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## Civil Engineering (82)

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J. Harold Zoller, *Professor and Chairman*; Russell R. Skelton, *Professor Emeritus*; Charles O. Dawson, *Professor*; Harold E. Langley, Jr., *Associate Professor*; Tung-Ming Wang, *Associate Professor*; Robert P. Vreeland, *Associate Professor*; John L. Sanborn, *Assistant Professor*; Louis H. Klotz, *Assistant Professor*

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### 501, (501). ELEMENTARY SURVEYING

A course for non-civil engineering students in the theory and use of tape, level, transit, plane table, and stadia in making plane and topographic surveys. Computations and drafting exercises necessary for making surveys and maps for all purposes. Mr. Dawson. 2 lectures, 1 laboratory, 3 credits.

### 505. SURVEYING I

Engineering measurements, using tape, transit, level, and stadia, and the computation, adjustment, and plotting of such measurements. Prerequisite: Mathematics 425. 1 lecture, 2 laboratories, 3 credits.

### 506. SURVEYING II

Applications of engineering measurement theory; orientation by solar and Polaris observations; theory and use of the plane table; introduction to photogrammetry, simple curves, and electronic computations. Prerequisite: Civil Engineering 505. 1 lecture, 2 laboratories, 3 credits.

### 517. ENGINEERING MATERIALS

Methods of manufacture, structure, physical properties, and the application of the various materials used in civil engineering works, including timber, steel, cement, mineral aggregates, concrete, and bituminous materials. Laboratory tests and reports on the testing of mineral aggregates, concrete, steel, wood, and other engineering materials. Prerequisite: Mechanical Engineering 523 or concurrently. 3 lectures, 1 laboratory, 4 credits.

### 620. TRANSPORTATION ENGINEERING

The development, organization, administration, and inter-relation of transportation systems and facilities, including railroads, highways, airports, waterways, and pipe lines. Major emphasis will be given to the economics of location, geometric and structural design, construction materials, methods and costs, as applied to modern transportation engineering. Prerequisite: Civil Engineering 506. 3 credits.

### 642. FLUID MECHANICS

Properties of fluids; fluid statics; flow of incompressible and compressible ideal fluids; flow of real fluids; and measurement of fluid properties. Mr. Dawson and Mr. Zoller. Prerequisite: Mechanical Engineering 523. 3 lectures, 1 laboratory, 4 credits.

### 643. WATER SUPPLY AND TREATMENT

The sources, quantity, quality, and sanitary aspects of public water supplies. Methods of purification and distribution systems. Mr. Langley. Prerequisite: Civil Engineering 642. 3 lectures, 1 laboratory, 4 credits.

### 644. SEWERAGE AND SEWAGE TREATMENT

The theory and problems of sewerage, the principles governing the disposal of sewage, and the various methods of sewage treatment. Mr. Lang-

## Civil Engineering

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ley. Prerequisite: Civil Engineering 643. 3 lectures, 1 laboratory, 4 credits.

### 665. SOIL MECHANICS

Soil classification, physical properties including permeability, compressibility, bearing capacity, settlement and shear resistance are related to the principles underlying the behavior of soils subjected to various loading conditions. Underground exploration and typical foundation problems are included. Prerequisite: Civil Engineering 620 or permission of the instructor. 3 lectures, 1 laboratory, 4 credits.

### 681. THEORY OF STRUCTURES I

The stress analysis of structures under fixed and moving loads. Roof trusses, highway and railroad bridges; use of influence lines, lateral bracing, and portals. Computer solution of trusses. Prerequisite: Mechanical Engineering 523 or concurrently. 3 lectures, 1 design period. 4 credits.

### 685. THEORY OF STRUCTURES II

Beam and truss deflections. The analysis of continuous beams and rigid frames by classical and modern methods; indeterminate trusses. Prerequisite: Civil Engineering 681. 3 lectures, 1 design period, 4 credits.

### 692. STEEL DESIGN

The design of members and connections; tension and compression members, beams, plate girders; riveted, bolted, and welded joints. Prerequisite: Civil Engineering 517 and 681. 2 lectures, 1 design period, 3 credits.

### 693. REINFORCED CONCRETE DESIGN

The principles of reinforced concrete, including rectangular beams, slabs, T-beams, columns, footings, retaining walls. Prerequisite: Civil Engineering 685 or concurrently. 2 lectures, 1 design period, 3 credits.

### 696. INDEPENDENT STUDY

A limited number of qualified senior students will be permitted to pursue independent studies under faculty guidance and may write terminal theses reporting the results of their investigations. Prerequisite: Permission of instructor and senior standing. 2 to 4 credits.

### 711. COMMUNITY PLANNING

An introduction to community planning. Social, economic, and physical factors affecting community planning; content and extent of desirable community planning programs, including purpose and scope, the preliminary survey, elements of community land planning, the master plan, transportation systems, street patterns and traffic, motor vehicle parking, airport sites, public building sites, parks and recreational facilities, zoning, control of land subdivision, neighborhood centers, housing, legal, financial and economic problems, and redevelopment of blighted areas. Mr. Dawson. Prerequisite: Permission of instructor. 3 credits.

## 714. CONTRACTS, SPECIFICATIONS, AND PROFESSIONAL RELATIONS

The essential elements required in engineering contracts; the purposes and content of specifications; professional conduct, relations, and ethics; and estimating by means of quantity surveys and unit cost methods. Mr. Dawson. Prerequisite: Permission of instructor. 3 credits.

## 721. HIGHWAY ENGINEERING I

Highway organization, administration, finance, economics, planning, programming, traffic surveys, operations; highway laws, contracts, specifications; highway capacity, geometric design, access control, safety, accident studies; pavement selection, performance, and maintenance. Prerequisite: Civil Engineering 620. 3 lectures, 3 credits.

## 722. HIGHWAY ENGINEERING II

Design of flexible and rigid pavements and bases for highways, airports, and city streets; pavement selection, construction methods, materials, specifications, and engineering cost estimates. Prerequisite: Civil Engineering 620 and 665. 3 lectures, 3 credits.

## 741. HYDRAULIC ENGINEERING

Application of fluid mechanics to hydraulics problems, such as reservoirs, dams, control works, open-channel flow, hydroelectric power, irrigation, drainage, and multipurpose projects. Prerequisite: Civil Engineering 642. 2 lectures, 1 laboratory, 3 credits.

## 742. HYDROLOGY

The occurrence and physical effects of water on the earth, including meteorology, groundwater, runoff, and streamflow routing. Prerequisite: Civil Engineering 642 or concurrently. 2 lectures, 1 laboratory, 3 credits.

## 782. TIMBER DESIGN

Properties and characteristics of structural woods, mechanics of wood, connection methods, design of timber members and connections in beams, columns, and trusses, and glued laminates of wood. Prerequisite: Civil Engineering 685 and permission of instructor. 1 lecture, 1 design period, 2 credits.

## 784. STRUCTURAL COMPONENTS

Selected problems in the analysis and design of structural components; such as beams on elastic foundations, curved beams, beam columns, buckling, torsion. Prerequisite: Civil Engineering 685 and permission of instructor. 3 credits.

## 790. STRUCTURAL ENGINEERING

The planning and design of determinate and indeterminate structures. Introduction to modern design theories; pre-stressed concrete, plastic theory of steel and reinforced concrete. Prerequisite: Civil Engineering 693. 2 lectures, 1 design period, 3 credits.

## Economics (72)

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Carroll M. Degler, *Professor*; John A. Hogan, *Professor*; Ruth J. Woodruff, *Professor*; Robert F. Barlow, *Professor*; Sam Rosen, *Professor*; John W. McConnell, *Professor*; Kenneth J. Rothwell, *Associate Professor*; Allan J. Braff, *Associate Professor*; Manley R. Irwin, *Associate Professor*; Dwayne E. Wrightsman, *Assistant Professor*; Soon Chough, *Assistant Professor*; James H. Schultz, *Assistant Professor*; Lawrence P. Cole, *Assistant Professor*; John V. Donovan, *Instructor*; John R. Haskell, *Instructor*

### 401-402. PRINCIPLES OF ECONOMICS

A study of the principles underlying the organization and operation of the economy. Staff. 3 credits.

### 403 (403). ECONOMIC HISTORY OF THE UNITED STATES

Historical survey of the development of American business and industry with consideration of credit and trade institutions and of the role of government in the economy. 3 credits.

### 431-432. BUSINESS AND ECONOMIC STATISTICS

Statistical techniques as an aid in decision-making. Includes methods of collection, analysis and presentation of statistical data, introduction to probability theory, statistical inference, regression analysis, index numbers, quality control, and time series analysis. Staff. 3 credits.

### (652). PUBLIC FINANCE

Problems and policies of expenditure, revenue, and debt of the public sector. Economic analysis and evaluation of tax systems and governmental fiscal programs. Mr. Schulz. Prerequisite: Economics 402. 3 credits.

### 653. MONEY AND BANKING

An analysis of money, its supply, its demand, its impact on the economy and its control by the central bank. Mr. Wrightsman. Prerequisite: Economics 402. 3 credits.

### 657. GOVERNMENT REGULATION OF BUSINESS

A study of the role of government in economic affairs, with emphasis upon the regulation of competition and monopoly. Mr. Irwin. Prerequisite: Economics 402. 3 credits.

### 663. INTERNATIONAL TRADE AND FINANCE

Theory of international trade, foreign exchange, balance of payments, tariffs, and protection. The economic aspects of international relations, with particular reference to recent policies. Prerequisite: Economics 402. 3 credits.

### (664). COMPARATIVE STUDY OF ECONOMIC SYSTEMS

An examination of socialism, communism, capitalism, and modifications



of these economic systems, particularly as exemplified by the Soviet Union, China, Yugoslavia, France, the United Kingdom, and the United States. Mr. Donovan. Prerequisite: Economics 402. 3 credits.

**666. ECONOMIC DEVELOPMENT**

An analysis of the problems and available solutions confronting the under-developed areas of the world. Mr. Rothwell. Prerequisite: Economics 402. 3 credits.

**671. TRADE UNIONS AND INDUSTRIAL MANAGEMENT**

Trade union history, philosophy and policies. Historical development of management attitudes and the attitudes of law and legislation toward unions. Collective bargaining: its nature, purpose and public policy considerations. Mr. Gadon. Prerequisite: Economics 402. 3 credits.

**672. LABOR ECONOMICS**

Application of the tools of economic analysis to the market for labor. Wage determination and wage policy under union and non-union conditions. The determination of factor shares of the national income with particular emphasis on labor's share. Mr. Hogan. Prerequisite: Economics 402. 3 credits.

**673. INTERMEDIATE ECONOMIC ANALYSIS**

Analysis of supply and demand. The determination of prices, production, and the distribution of income in non-competitive situations as well as in the purely competitive model. General equilibrium. Mr. Braff. Prerequisite: Economics 402. 3 credits.

**675. NATIONAL INCOME ANALYSIS**

Macro-economic measurement, theory, and public policy determination. Mr. Rosen. Prerequisite: Economics 402. 3 credits.

**679-680. HISTORY OF ECONOMIC THOUGHT**

The evolution of economic thought, including the work of contemporary economists. Examination and critical appraisal of the work of major economists and major schools of economists particularly with reference to the applicability of their theories to current economic problems. Prerequisite: Economics 402. 3 credits.

**695-696. INDEPENDENT STUDY**

Individual study projects of special interest and benefit to the student. Permission to pursue an independent study project is required from the student's adviser, proposed project instructor, and the Executive Committee. Permission will be granted only to students who have demonstrated superior scholastic achievement. 3-12 credits per semester.

**704, 705. ECONOMIC HISTORY**

An analysis of the development of the American and European economies. Prerequisite: Permission of instructor. 3 credits.



### (725). BUSINESS HISTORY

A survey of the development of business enterprise and its institutions in Western Europe and the United States from the late Middle Ages to the era of the giant diversified corporation. Emphasis is placed on the role of the entrepreneur, the impact of public policy on business, and the case study of individual firms. Mr. Greenleaf. 3 credits. (This course is the same as Business Administration 725 and History 725.)

### 727. PUBLIC POLICY IN SOCIAL AND LABOR LEGISLATION

American social and labor legislation of the recent decades and the way in which American economic and human values have been implemented and modified by law. Legislation and private industry programs in social security, reemployment, unemployment insurances, health services, training and retraining and fair employment practice. Lectures, discussion, assigned reading, and individual student projects. Prerequisite: One year's work in economics or sociology. Mr. McConnell. 3 credits. (This course is the same as Sociology 727.)

### 754. ADVANCED MONEY AND BANKING

Emphasis on central banking, monetary policy and monetary theory. Study of current problems and developments in banking. Mr. Degler. 3 credits.

### 774. MATHEMATICAL ECONOMICS

An introduction to the principal mathematical techniques and their application in economics. Mr. Braff. Prerequisite: Permission of instructor. 3 credits.

### 776. ECONOMIC FLUCTUATIONS

The study of recurrent movements of prosperity and depression, with emphasis upon causes and public implications. Mr. Rosen. Prerequisite: Economics 675 or permission of instructor. 3 credits.

### 781. STATISTICAL THEORY

The theoretical basis of statistical methods, probability, probability distributions, statistical inference, and decisions. Mr. Cole. Prerequisite: Permission of instructor. 3 credits.

### 782. ECONOMETRICS

The application of statistics and mathematics to economic problems. The formulation of economic models, their measurement and verification. Mr. Cole. Prerequisite: Permission of instructor. 3 credits.

### 784. STATISTICAL DECISION MAKING

The application of probability and statistics to decision problems. Special emphasis on the Bayesian approach to decisions under uncertainty. Mr. Braff. Prerequisite: Permission of instructor. 3 credits.

## Education (48)

Roland B. Kimball, *Professor and Chairman*; Thomas O. Marshall, *Professor*; Wayne S. Koch, *Professor*; Everett B. Sackett, *Professor*; Carleton P. Menge, *Professor*; David D. Draves, *Associate Professor*; Walter N. Durost, *Associate Professor*; Joseph J. Petroski, *Associate Professor*; Angelo V. Boy, *Associate Professor*; Gerald J. Pine, *Associate Professor*; Deborah E. Stone, *Assistant Professor*; Michael D. Andrew, *Assistant Professor*; Gilbert R. Austin, *Assistant Professor*; Jason Boynton, *Assistant Professor*; Carl J. Cooper, *Assistant Professor*; Philip E. Northway, *Assistant Professor*; Philip M. Smith, *Assistant Professor*; John D. Bardwell, *Lecturer*; Helen Durio, *Lecturer*; Paul G. Spilios, *Lecturer*; Claire Wright, *Lecturer*

Elizabeth R. Boyce, *Instructor, (Education and History)*; Ernst O. Forster, *Instructor, (Education and Languages)*; George F. Griewank, *Instructor, (Education and English)*; Daniel J. Heisey, *Instructor, (Education and Mathematics)* Harold Kilbreth, *Instructor, (Education and Science)*

William H. Annis, *Assistant Professor (Agricultural-Education)*; George R. Thomas, *Professor (Art-Education)*; Paul E. Schaefer, *Associate Professor (Biology-Education)* Lewis C. Goffe, *Associate Professor (English-Education)*; William R. Jones, *Associate Professor (History-Education)*; Marjory A. Wybourn, *Professor (Home Economics-Education)*; Richard H. Balomenos, *Assistant Professor (Mathematics-Education)*; John B. Whitlock, *Associate Professor (Music-Education)* Gavin H. Carter, *Associate Professor (Physical Education)*; Marion C. Beckwith, *Professor (Physical Education)*

*Cooperating Teachers:* Richard Aieta, Elsie Amazeen, Iria Anderson, Janet Atkins, Blanche Bailey, Alice Bassett, Beveraly Baum, Given Beane, Stanley Bednarz, Agnes Berriman, Valerie Bloom, Hugo Bolin, Kenneth Bowlen, Elizabeth Brennan, Howard Bush, Marguerite Chamberlain, Norma Chisholm, Harriet Claridge, William Childs, Martha Cline, Dorothy Colprits, Florence Conduan, Lelie Cooper, Melvin Cross, Margaret Cyr, David Deshon, Janie Detour, Barbara Divittori, Robert Dodge, Frances Doe, William Elwell, Marilyn Evans, Grace Felker, Carolyn Foley, Jean Frasier, Elizabeth Gailey, Hilda Gerrish, Willard Gow, Marilyn Greene, Constance Griffin, Noreen Grover, Susan Hake, Paul Hamel, Joyce Hanrahan, Cynthia Harmon, Peter Hayes, Harriet Hughes, Elizabeth Irelande, Priscilla Jenness, Marguerite Jones, Thomas Justice, Joel Kabatznick, Edward Labbe, Raymond LaBranche, Raymond Lavin, Janet Layton, Martha Lefebvre, Anne Leuiken, Margaret Linton, Rena Lovett, Lillian Lurvey, Arline MacDonald, Shirley Mader, George Manix, Russell Mann, Paul Marashio, David Markell, Dorothy Maskwa, Ella Massaro, John McCarthy Jr., Elizabeth McClain, J. Harris Melia, Ida Merrill, Sandra Metes, Catherine Minehan, Arthur Mirabile, Donald Misenti, Myrtle Moore, Robert

## Education

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Moore, Helen Murray, Joan Murray, Frances Nesbitt, Frances Paul, Marjorie Perkins, Marie Peters, C. Paul Quimby, Phyllis Quimby, Emmerzet Rand, Carolyn Reed, Mary Riley, Elizabeth Robertson, James Robinson, Alice Rowe, Marietta Sewall, Marjorie Shordt, John Splaine, Gail Stevens, Sadie Stevens, Arlene Stewart, Beveraly Strout, William Tadler, Joseph Tardie, Elizabeth Tentirarelli, Ann Thayer, Martha Thyng, John Tibbetts, Patricia Towle, Enid Urich, Maureen Walsh, Mildred Weeks, Ruth Weidenermer, Edith Whittum, Irene Wight, Mary Willette, Joan Wood, Inez Woodberry, and Edith Worthen

### Courses in Education

#### 481, (481). AN EDUCATIONAL PSYCHOLOGY OF DEVELOPMENT

This course considers the philosophical and psychological principles underlying the process of education. Through a critical examination of human behavior, the student gains self-knowledge and an understanding of principles that affect all men. An analysis of popular novels, autobiographical reports, and technical studies constitutes the basis for group thinking and discussion. Prerequisite: See footnote.\* 3 credits.

#### 757, (757). PSYCHOLOGY OF HUMAN LEARNING

Psychology of learning as it operates within the classroom. Prerequisite: See footnote.\* 3 credits.

#### (758), 758. PRINCIPLES OF TEACHING

Application of the theories of learning studied in Education 757, with emphasis upon the following: organization of conduct, specific planning, and a study of procedures essential to the evaluation of the learning processes. Prerequisite: see footnote.\* 3 credits.

#### 759, (759). PRINCIPLES OF EDUCATION

American schools have developed, and are still developing, in unique forms quite unlike their European counterparts. Among Americans, however, there are basic disagreements concerning the direction our schools should take. This course deals with these conflicts of philosophy, the problems of American education and research pertinent to these problems. Prerequisite: See footnote.\* 3 credits.

#### (763). INSTRUCTIONAL MEDIA

To help improve ability to communicate ideas through materials and equipment commonly available in a school audio-visual center. Educa-

\* The prerequisite for courses in education is based on the following:

Education 481: Open to any student, sophomore or above.

Education 757, 758, 759: Prerequisite is permission of the department. General requirement is cumulative average of 2.2 or better, and 2.5 or better in major. A speech test must be taken prior to Education 758.

Education 741-742: Senior standing, completion of all General Liberal Arts requirements, 18 semester hours in a Liberal Arts major subject, personality suitable for teaching, experience working with groups of children, Education 481 or Home Economics 425 with grade of C or better, cumulative average of 2.2, and permission of the department.

tional films, bulletin board design, the role of language labs, educational television, programmed learning, and media research. A laboratory period of one hour each week is required in addition to the regular class period. Prerequisite: Education 757 or permission of instructor. 3 credits.

**785. EDUCATIONAL TESTS AND MEASUREMENT**

Strategies for discovering and employing predictive validities of standardized tests in public school work. 3 credits.

**741-742. ELEMENTARY SCHOOL TEACHER PREPARATION**

A block program including observation; psychology of learning; principles of teaching reading, language arts, social studies, mathematics, science, and other elementary school subjects; student teaching; and a synthesizing seminar. Prerequisite: See footnote.\* 16 credits per semester.

**Courses in Problems in the Teaching of School Subjects**

The following courses are devoted to a study of problems, objectives, selection and organization of subject matter, teaching and testing techniques, and classroom management in the teaching of the respective subjects. For details concerning prerequisites and nature of these courses, see descriptions given under respective subject matter departments.

**AGRICULTURAL EDUCATION 650. PRINCIPLES OF AGRICULTURAL EDUCATION**

Mr. Annis. 3 credits.

**AGRICULTURAL EDUCATION 651, 652. METHODS OF TEACHING AGRICULTURAL MECHANICS**

Mr. Gilman. 1 laboratory, 1 credit.

**AGRICULTURAL EDUCATION (792). PLANNING FOR TEACHING**

Mr. Annis. 4 credits

**ART-EDUCATION 792. PROBLEMS OF TEACHING ART IN ELEMENTARY SCHOOLS**

Mr. Thomas. 3 credits.

**ART-EDUCATION 791. PROBLEMS OF TEACHING ART IN SECONDARY SCHOOLS**

Mr. Thomas. 3 credits.

**BIOLOGY-EDUCATION 791. PROBLEMS IN THE TEACHING OF HIGH-SCHOOL BIOLOGY**

Mr. Schaefer. 3 credits.

**ENGLISH-EDUCATION 791. PROBLEMS IN THE TEACHING OF HIGH-SCHOOL ENGLISH**

Mr. Goffe. 3 credits

**HISTORY-EDUCATION 791. PROBLEMS IN THE TEACHING OF HIGH-SCHOOL HISTORY AND OTHER SOCIAL STUDIES**

Mr. Draves. 3 credits.

## Education

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HOME ECONOMICS-EDUCATION 791. PROBLEMS IN THE TEACHING OF HIGH-SCHOOL HOME ECONOMICS

Miss Wybourn. 3 credits

LANGUAGES-EDUCATION 791. PROBLEMS IN THE TEACHING OF MODERN LANGUAGES IN THE HIGH-SCHOOL

3 credits

LATIN-EDUCATION 791. PROBLEMS IN TEACHING HIGH SCHOOL LATIN

3 credits.

MATHEMATICS-EDUCATION 791. PROBLEMS IN THE TEACHING OF HIGH-SCHOOL MATHEMATICS

Mr. Balomenos. 3 credits.

MUSIC-EDUCATION 792. PROBLEMS IN THE TEACHING OF ELEMENTARY SCHOOL MUSIC

Mr. Whitlock. 3 credits

MUSIC-EDUCATION 791. PROBLEMS IN THE TEACHING OF SECONDARY SCHOOL MUSIC

Mr. Whitlock. 3 credits.

PHYSICAL EDUCATION-EDUCATION 792. PROBLEMS OF TEACHING PHYSICAL EDUCATION IN THE ELEMENTARY SCHOOL

3 credits.

### Courses in Supervised Teaching

Student teaching is required in the Teacher Preparation program. It is open only to students whose applications are approved by the Department of Education and the department(s) of the subject(s) which the applicant desires to teach. Approval will be based upon the following: a cumulative university average of 2.2; a grade point average of 2.5 in the subjects of the field(s) in which supervised teaching is to be done; a 2.5 grade point average in all education courses; at least 18 semester hours of work completed in the subject(s) to be taught; personal qualities and attitudes appropriate for classroom teaching. Application should be made through the Department of Education during the week preceding November 10 or April 10 of the semester immediately preceding the semester in which supervised teaching is to be done.

Students may enroll for 9 or 14 credits\* in supervised teaching. Approval to receive 9 credits for secondary supervised teaching must be granted by the Director of Secondary Student Teaching *and* the applicant's subject department.

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\* Except for Education-Agriculture 794, 11 credits; Education-Home Economics 794, 7 credits; Education-Physical Education 790, 6 credits.



## Electrical Engineering

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EDUCATION-AGRICULTURE (794). SUPERVISED TEACHING IN AGRICULTURE

Prerequisite: senior standing in agricultural education curriculum.

EDUCATION-ART 794. SUPERVISED TEACHING IN ART

EDUCATION-BIOLOGY 794. SUPERVISED TEACHING IN HIGH SCHOOL BIOLOGY

EDUCATION-ELEMENTARY 793. SUPERVISED TEACHING IN THE ELEMENTARY SCHOOL

EDUCATION-ENGLISH 794. SUPERVISED TEACHING IN HIGH SCHOOL ENGLISH

EDUCATION-HISTORY 794. SUPERVISED TEACHING IN HIGH SCHOOL HISTORY AND OTHER SOCIAL STUDIES

EDUCATION-HOME ECONOMICS 794. SUPERVISED TEACHING IN HIGH SCHOOL HOME ECONOMICS

EDUCATION-LANGUAGE 794. SUPERVISED TEACHING IN HIGH SCHOOL MODERN FOREIGN LANGUAGE

EDUCATION-LATIN 794. SUPERVISED TEACHING IN HIGH SCHOOL LATIN

EDUCATION-MATHEMATICS 794. SUPERVISED TEACHING IN HIGH SCHOOL MATHEMATICS

EDUCATION-MUSIC 793, 794. SUPERVISED TEACHING IN ELEMENTARY AND SECONDARY SCHOOL MUSIC

EDUCATION-PHYSICAL EDUCATION 790. DIRECTED TEACHING OF PHYSICAL EDUCATION

Prerequisite: Physical Education-Education 792 or concurrently.

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## Electrical Engineering (83)

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Joseph B. Murdoch, *Professor and Chairman*; Leon W. Hitchcock, *Professor Emeritus*; William B. Nulsen, *Professor Emeritus*; Alden L. Winn, *Professor*; Robert N. Faiman, *Professor*; John B. Hrabá, *Professor*; Albert D. Frost, *Professor*; Fletcher A. Blanchard, *Associate Professor*; Kerwin C. Stotz, *Associate Professor*; Donald W. Melvin, *Associate Professor*; Ronald R. Clark, *Associate Professor*; H. Richard Skutt, *Associate Professor*; Robert W. Goodrich, *Assistant Professor*; Filson H. Glanz, *Assistant Professor*; Joseph D. Bronzino, *Assistant Professor*; Glen E. Gerhard, *Assistant Professor*

### 501-502. ELECTRICAL ENGINEERING

The fundamental physical laws and concepts of electrical engineering and their application to electric and magnetic circuits. Prerequisite: Mathematics 426 or 523 taken concurrently and Physics 404. 3 recitations, 1 laboratory, 4 credits.



## Electrical Engineering

### 503. ELECTRICAL CIRCUIT THEORY III

Generalized network analysis, one- and two-port networks, elementary synthesis, filter properties, analysis of interconnected passive networks, steady-state and transient analysis of distributed parameter networks. Prerequisite: Electrical Engineering 502. 4 credits.

### 505. ELECTRICAL ENGINEERING MATERIALS

Electric and magnetic properties of materials, conductors, semiconductors, dielectrics, and magnetic materials. Prerequisite: Physics 502. Meets 5 recitations first 3/5 of semester. 3 credits.

### 507. ELECTRONIC DEVICES

A continuation of Electrical Engineering 505. Properties and characteristics of semiconductor devices, vacuum tubes, and gas tubes. Prerequisite: Electrical Engineering 505 taken concurrently. Meets 5 recitations last 2/5 of semester. 2 credits.

### 509. FIELDS AND WAVES

Electric, magnetic, and electromagnetic fields. Maxwell's equations, wave equations, plane waves. Prerequisite: Math 528 and Physics 501. 3 credits.

### 510. ELECTRONIC CIRCUITS I

Theory of operation, analysis, and design of active circuits containing electronic devices. Prerequisite: Electrical Engineering 507. 4 credits.

### 517. ELECTRICAL LABORATORY I

Experimental investigations in the principles of electrical engineering as applied to electrical engineering devices, components, and systems. Prerequisite: Electrical Engineering 503, 505, 507, all taken concurrently. 1 recitation, 2 laboratories, 3 credits.

### 518. ELECTRICAL LABORATORY II

Extension of Electrical Engineering 517. Prerequisite: Electrical Engineering 510 and 520 taken concurrently. 1 recitation, 2 laboratories, 3 credits.

### 520. ENERGY CONVERSION

Theory and analysis of transformers and electro-mechanical energy converters. Prerequisite: Electrical Engineering 502 and 509. 4 credits.

### 525, 526. ELECTRICAL LABORATORY

Experimental investigations in the principles of electrical engineering as applied to electrical engineering systems, devices and components. Formal reports are required. Prerequisite: Electrical Engineering 514 and 510. Required of seniors in electrical engineering. 1 laboratory, 2 credits.

### 533. FUNDAMENTALS OF ELECTRICAL ENGINEERING

Direct- and alternating-current circuits, instruments and machines, and

rectifiers and transformers. Prerequisite: Physics 501. Required of majors in chemical and civil engineering. 3 lectures, 1 laboratory, 4 credits.

### 539. ELECTRICAL ENGINEERING FUNDAMENTALS

Electric and magnetic fields and circuits. Prerequisite: Physics 501. Required of juniors in mechanical engineering. 3 lectures, 1 laboratory, 4 credits.

### 611. ELECTRONIC CIRCUITS II

Two-state circuits and devices. Switching. Boolean algebra and binary system logic. Analog-digital conversion. Information storage and retrieval. Prerequisite: Electrical Engineering 510. 3 recitations, 1 laboratory, 4 credits.

### 640. CIRCUITS, MACHINERY, AND CONTROL

Continuation of electric circuits. Applications of electrical engineering to machines and systems. Prerequisite: Electrical Engineering 539. 3 lectures, 1 laboratory, 4 credits.

### 641. ELECTRONIC FUNDAMENTALS

Physical electronics, electronic circuits with emphasis on instrumentation. Prerequisite: Electrical Engineering 533 or 539. Required of seniors in mechanical engineering, 2 lectures, 1 laboratory, 3 credits.

### 645. ELECTRICAL NETWORKS

Generalized network analysis, equivalent networks, filter properties, elementary synthesis, transient, and steady-state analysis of transmission lines. Prerequisite: Electrical Engineering 515 or 504. 3 credits.

### 646. ELECTRIC FIELDS

Static electric and magnetic fields, electromagnetic fields, Maxwell's equations, wave equations, plane waves. Prerequisite: Electrical Engineering 502 and Mathematics 527. Required of seniors in electrical engineering. 3 credits.

### 652. INDUSTRIAL ELECTRONICS FUNDAMENTALS

Application of electronics to industrial processes. Prerequisite: Electrical Engineering 641. Normally limited to students not registered in the electrical engineering curriculum. 2 lectures, 1 laboratory, 3 credits.

### 695. ELECTRICAL ENGINEERING PROJECTS

A laboratory or advanced study course. Each student will either join one of the department research projects or engage in a project which is in one of the areas of current staff interest. Admission to the course will be limited to those accepted by a staff member. 1-4 conferences or 1-2 laboratories, 1-4 credits.

### 706. ADVANCED CIRCUIT THEORY

Analytical techniques in electrical circuits and systems. Prerequisite:

## Electrical Engineering

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Permission of instructor. 3 lectures, 1 conference, 4 credits. When offered without conference period, 3 credits.

### 741-742. FUNDAMENTALS OF ACOUSTICS

The development of the acoustical wave equation for gases, solids, and liquids; reflection and refraction, and absorption; characteristics of acoustic sources, directivity of multi-source arrays; acoustical measurements, and architectural acoustics; airborne noise control. Prerequisite: Physics 502 and Mathematics 527. 1 recitation, 2 hours, 2 credits.

### 757. ELECTRONIC SYSTEMS ANALYSIS AND DESIGN

Techniques in coding, storage, and transfer of information. Analysis and design of electronic systems. Prerequisite: permission of instructor. 3 credits.

### 762. ILLUMINATION

Radiation, fundamental processes in gases, atomic spectra, sources of visible and near visible energy, lamp circuitry, lighting and wiring design, control of light, photometry, and color. Prerequisite: permission of instructor. 2 credits.

### TECHNOLOGY 780, (780). ENGINEERING ANALYSIS

The basic principles and analytical methods employed in the solution of complex problems in the various branches of engineering. Prerequisite: permission of instructor. 2-3 credits.

### 781. INSTRUMENTATION

Analysis and design of equipment for measurement, instrumentation, and control. 3 recitations, 1 laboratory, 4 credits.

### 782. CONTROL SYSTEMS

Fundamental principles involved in the design and analysis of feedback control. 3 recitations, 1 laboratory, 4 credits.  
credits or 3 lectures and 1 laboratory, 4 credits.

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## English (49)

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John C. Richardson, *Associate Professor and Chairman*; William G. Hennessy, *Professor Emeritus*; Sylvester H. Bingham, *Professor*; Robert G. Webster, *Professor*; J. Howard Schultz, *Professor*; Dale S. Underwood, *Professor*; G. Harris Daggett, *Professor*; Max S. Maynard, *Associate Professor*; Lewis C. Goffe, *Associate Professor*; Edmund G. Miller, *Associate Professor*; Philip L. Nicoloff, *Associate Professor*; Thomas A. Williams, Jr., *Associate Professor*; Donald M. Murray, *Associate Professor*; Robert D. Hapgood, *Associate Professor*; Hugh M. Potter, III, *Assistant Professor*; John A. Yount, *Assistant Professor*; Thomas A. Carmicelli, *Assistant Pro-*

fessor; S. Anthony Caldwell, *Instructor*; Bruce D. Allen, *Instructor*; James T. Sullivan, *Instructor*; Garrett C. Chitwood, Jr., *Instructor*; Richard L. Pevear, *Instructor*; George E. Barr, *Instructor*; Hidde H. Van Ameyden van Duym, *Instructor*; Julian H. Smith, III, *Instructor*; David V. Siddall, *Instructor*; Matthew von Baeyer, *Instructor*; Nancy H. Deane, *Instructor*; Edward J. Haurahan, *Instructor*; Helen Hollingsworth, *Instructor*; Peter R. Keville, *Instructor*; Jean M. Sanborn, *Instructor*; Mark R. Smith, *Instructor*; Theodore M. Weesner, *Instructor*

### 301. IMPROVEMENT IN WRITING\*

Required of all students whose attainments in the *fundamentals of English* are found to be unsatisfactory. 3 recitations, no credit. NLG.

### 302. IMPROVEMENT IN READING\*

Intensive drill in reading skills for six weeks. 3 recitations, no credit. NLG.

### 401-402. FRESHMAN ENGLISH

Training to write more correctly and with more force and to read with more appreciation and discernment the chief types of literature. The staff of the department under the chairmanship of Mr. Sullivan. 3 credits. *No credit toward a major.*

### 501 (501). EXPOSITORY WRITING

The discipline of non-fiction writing. Weekly papers and frequent conferences required. Prerequisite: Engl. 401-402. 3 credits. *Written permission of instructor required for registration. No credit toward a literature major.*

### 513, 514. AN INTRODUCTION TO ENGLISH LITERATURE

The development of English literature from its beginning to the 20th century by means of selected readings. Mr. Caldwell, Mr. Carmicelli, Miss Hollingsworth, Mr. Siddall, Mr. Sullivan, Mr. van Duym. Prerequisite: English 401-402. 3 credits. *No credit toward a literature major.*

### 515, 516. A SURVEY OF AMERICAN LITERATURE

Mr. Webster, Mr. Daggett, Mr. Goffe, Mr. Nicoloff, Mr. Potter, Mr. Chitwood, Mr. J. H. Smith, Mr. Griewank. Prerequisite: English 401-402. 3 credits. *No credit toward a literature major.*

### 518. THE BIBLE AS LITERATURE

The various literary types found in the Bible and a survey of the influence of the Bible on English literature. Mr. Schultz. Prerequisite: English. 401-402. (Alternate years; offered in 1967-68.)

\* Any student may be recalled and reassigned to an instruction group at any time in his four years at college upon report of any member of the Faculty that his work in composition or in reading is deficient.

### 521-522. NEWS WRITING

A laboratory course in the techniques of journalism. The student is taught to report and write under strict limitations of time and space. Mr. Murray. Prerequisite: English 401-402. 3 credits. *Written permission of instructor required for registration. No credit toward a literature major.*

### 523. WRITING OF TECHNICAL REPORTS

Required of seniors in Agriculture and in Electrical and Civil Engineering. Mr. Webster and Mr. Weesner. 2 credits.

### 525-526. WRITING FICTION AND POETRY

A workshop in the fundamental techniques of fiction and poetry. Individual conferences. Mr. Williams and Mr. Yount. Prerequisite: English 401-402. 3 credits. *May be repeated for credit with the approval of the department chairman. Written permission of instructor required for registration. No credit toward a literature major.*

### 695, 696. SENIOR HONORS

Open to senior English literature majors who, in the opinion of the department, have demonstrated the capacity to do superior work in English. In the first semester the student will examine a series of special literary problems and write a number of short papers. In the second semester, he will investigate independently one or two larger topics and write one or two long papers. Of the nine credits awarded (3 the first semester, 3 or 6 the second semester), 6 may be counted toward the 24 which constitute a major in English literature. 3 or 6 credits. *Open to seniors by departmental invitation only.*

### 701-702. ADVANCED WRITING OF FICTION AND POETRY

Workshop discussions of advanced writing problems and readings of students' fiction, poetry, or plays. Individual conferences. Mr. Williams. Prerequisite: English 525-526 or its equivalent. 3 credits. *May be repeated for credit with the approval of the department chairman. Written permission of instructor required for registration. No credit toward a literature major.*

### 703-704. WRITING NON-FICTION

The techniques of advanced expository writing will be discussed and practiced in weekly papers the first semester. An article of considerable length and serious content will be written and re-written during the second semester. Workshop discussions and individual conferences. Mr. Murray. Prerequisite: English 501, 521-522, 525-526, or an equivalent. 3 credits. *May be repeated for credit with the approval of the department chairman. Written permission of instructor required for registration. No credit toward a literature major.*



705. ENGLISH GRAMMAR

Mr. Goffe. Required of students in the teacher preparation program and open to other students with the permission of the instructor. 3 credits.  
*No credit toward a literature major.*

709, 710, 711. CRITICAL ANALYSIS

Analysis of three forms of writing: 709, exposition; 710, fiction; 711, poetry; Mr. Bingham and Mr. Richardson. 3 credits. *No credit toward a literature major.*

(751). HISTORY OF THE ENGLISH LANGUAGE

Mr. Carnicelli. 3 credits.

753. ANGLO-SAXON

Mr. Carnicelli. 3 credits.

754. BEOWULF

Mr. Carnicelli. 3 credits.

755, 756. CHAUCER

Mr. Underwood. 3 credits

757, 758. SHAKESPEARE'S PLAYS

The major histories, comedies, and tragedies. Mr. Schultz and Mr. Hapgood. 3 credits.

759. MILTON

Mr. Schultz. 3 credits. (Alternate years; offered in 1967-68.)

760. BOSWELL'S JOHNSON

Mr. Maynard. 3 credits. (Not offered in 1967-68.)

761. WORDSWORTH

Mr. Miller. 3 credits. (Alternate years; not offered in 1967-68.)

762. BROWNING

Mr. Daggett. 3 credits. (Alternate years; offered in 1967-68.)

763, 764. ENGLISH LITERATURE IN THE SIXTEENTH CENTURY

Mr. Schultz. 3 credits. (Alternate years; not offered in 1967-68.)

765, 766. ENGLISH LITERATURE IN THE SEVENTEENTH CENTURY

Mr. Underwood. 3 credits. (Alternate years; offered in 1967-68.)

767, 768. ENGLISH LITERATURE IN THE EIGHTEENTH CENTURY

Mr. Maynard. 3 credits.

769, 770. THE ENGLISH ROMANTIC PERIOD

Wordsworth, Coleridge, Lamb, Hazlitt, Byron, Shelly, Keats, DeQuincey.  
Mr. Miller. 3 credits. (Alternate years; offered in 1967-68.)

771, 772. VICTORIAN PROSE AND POETRY

Major non-fiction prose from Carlyle to Stevenson and major poetry



## English

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from Tennyson to Hardy. Mr. Miller. 3 credits. (Alternate years; offered in 1967-68.)

773, 774. BRITISH LITERATURE OF THE TWENTIETH CENTURY

Mr. Daggett and Mr. Richardson. 3 credits.

775. NEW ENGLAND RENAISSANCE

Emerson, Thoreau, and other transcendentalists. Mr. Daggett. 3 credits. (Alternate years; not offered in 1967-68.)

776, AMERICAN NOVEL IN THE NINETEENTH CENTURY

Mr. Webster. 3 credits. (Alternate years; offered in 1967-68.)

777. AMERICAN POETRY OF THE NINETEENTH CENTURY

Mr. Daggett. 3 credits. (Alternate years; offered in 1967-68.)

779, 780. AMERICAN LITERATURE OF THE TWENTIETH CENTURY

Mr. Nicoloff. 3 credits.

781, 782. INTRODUCTION TO ENGLISH DRAMA

The development of English drama, exclusive of Shakespeare, from the Middle Ages to the present. Mr. Hapgood. 3 credits. (Alternate years; offered in 1967-68.)

783, 784. THE ENGLISH NOVEL OF THE EIGHTEENTH AND NINETEENTH CENTURIES

Mr. Bingham and Mr. Miller. 3 credits.

ENGLISH EDUCATION 791. PROBLEMS IN THE TEACHING OF HIGH SCHOOL ENGLISH

Principles and methods of teaching literature and composition in secondary schools. For all students who plan to teach English in secondary schools and for all students majoring in language, history, or education. Mr. Goffe. Prerequisite: a grade of C or better in Education 758. Literature majors in English by permission of the instructor; all other students by fulfillment of the following: English 501, 513, 514, 516, 709, 710, 711; one semester of English 757, 758; a demonstration of skill in the use of English grammar, either by the satisfactory completion of English 705 or by examination. 3 credits. *No credit toward a literature major.*

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## Entomology (29)

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James G. Conklin, *Professor and Chairman*; Walter C. O'Kane, *Professor Emeritus*; Robert L. Blickle, *Professor*; R. Marcel Reeves, *Assistant Professor*

(402), 402. INTRODUCTORY ENTOMOLOGY

An introduction to entomology in its broad aspects. The structure, bi-

ology, and classification of insects. This course should be particularly useful to students contemplating a major in entomology or in the general field of biology-education. Each student is required to make an insect collection. Open to any student. Mr. Conklin. 2 lectures, 1 laboratory, 3 credits.

### 506. FOREST ENTOMOLOGY

Structure and development of insects. Orders and families of insects of importance to foresters. Principles of insect control. Biology and control of representative forest insects. Each student is required to make an insect collection. Adapted especially for forestry majors. Open to any student. Mr. Conklin. 2 lectures, 1 laboratory, 3 credits.

### 704. MEDICAL ENTOMOLOGY

Insects and arachnids in relation to public health. The more important disease carriers, their biologies, and means of control. Adapted especially for students interested in public health or medicine. Mr. Blickle. Elective for juniors and seniors. 2 lectures, 1 laboratory, 3 credits.

### 707, 708. ADVANCED ENTOMOLOGY

The anatomy and physiology of insects. Systematic entomology. Mr. Conklin, Mr. Blickle. Required of entomology majors. Open to others by permission of the department chairman. 2 lectures, 2 laboratories, 4 credits.

### 709, 710. ADVANCED ECONOMIC ENTOMOLOGY

Problems in applied entomology; the literature of economic entomology; investigational methods; studies of the specialized phases of entomology. Mr. Conklin, Mr. Blickle. Required of entomology majors. Open to others by permission of the department chairman. 1-3 credits.

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## Forest Resources (30)

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Paul E. Bruns, *Professor and Chairman*; Clark L. Stevens, *Professor Emeritus*; Oliver P. Wallace, *Associate Professor*; Harold W. Hocker, Jr., *Associate Professor*; John L. Hill, *Associate Professor*; Roger P. Sloan, *Assistant Professor*; Bennett B. Foster, *Assistant Professor*; David P. Olson, *Assistant Professor*; Richard R. Weyrick, *Assistant Professor*; R. Marcel Reeves, *Assistant Professor*; Ernst J. Schreiner, *Adjunct Professor*

### 401. CONSERVATION OF FOREST RESOURCES

The wildland renewable resources include game, vegetation including timber, water and soil. Both the use and preservation of forest resources are important to man. Conflicts between use and preservation and among the uses may arise, which men must continually resolve. These concepts

and practices are studied within the framework of man's economic and social structure. Elective for all students except freshmen and forestry majors. Mr. Wallace. Staff. 3 credits.

### 425. DENDROLOGY

The identification, classification and silvical characteristics of trees and shrubs in autumn and winter. An introduction to plant taxonomy, ecological succession, soils and plant geography. The principal forest regions of North America: their location, extent, climatic conditions and important timber species. Required of freshmen in forestry. Elective for others. Mr. Olson. 2 lectures, 1 laboratory, 3 credits.

### 426. WOOD TECHNOLOGY

An introduction to the fundamental properties of wood including macro- and microstructure; physical, chemical and mechanical properties. Introduction to seasoning and preservation of wood. Identification of commercially important timbers. Prerequisite: Forest Resources 425 or permission of instructor. Mr. Hill. 2 lectures, 2 laboratories, 4 credits.

### 527. SILVICS

The ecological basis of silviculture. Classification of forest communities; environmental factors and their influence on forest vegetation; influence of vegetation on environment. Mr. Hocker. Prerequisite: Botany 411; Forest Resources 425 or Botany 506. 2 lectures, 1 laboratory, 3 credits.

### 528. APPLIED STATISTICS I

Statistical procedures with emphasis on biometrics. Computational procedures and interpretation of results will be covered in lecture and laboratory. Mr. Durgin. Prerequisite: 3 credits of mathematics. 2 lectures, 1 laboratory, 3 credits.

### 542. FOREST SURVEYING

The use of common forest engineering and surveying equipment and techniques. Course to include use and preparation of maps with various types of equipment and methods, logging road location, public land survey, and courthouse search for deeds and surveys. Mr. Foster. Prerequisite: sophomore standing and Civil Engineering 501 or permission of instructor. Two week field session in June. 3 credits.

### 543. FOREST MENSURATION

Theory and practice in the basics of forest mensuration. Forest inventory, growth and yield, volume table construction, and elements of photogrammetry. The application of statistical procedures in forest mensuration. Prerequisite: Mathematics 407-408 or equivalent, Mathematics 401, Forest Resources 528, 542. 2 lectures, 1 4-hour laboratory, 4 credits.

### 544. FOREST ECONOMICS

Principles of economics as applied to the analysis of the past, present and probable future supply and demand situation for forest products

and services. Forestry and the general economy including relevant institutional factors, economics of the firm and industry with special reference to the time dimension of value. Forest taxation. Mr. Foster. Prerequisite: at least one course in the principles of economics. 4 credits.

**629. SILVICULTURE**

The theory and techniques of applying ecological knowledge to the control of establishment, composition, and growth of forest stands for economic purposes. Field practice including marking of stands for various kinds of cutting and for cultural treatment. Mr. Hocker. Prerequisite: Forest Resources 425; Forest Resources 527 or Botany 742. 2 lectures, 1 laboratory, 3 credits.

**653. LOGGING ECONOMICS**

Application of economic principles to the study of forest products harvesting. The use of quantitative methods in developing harvesting cost and production functions, including introduction to linear programming, and computer applications. Field time study problems. Mr. Foster. Prerequisite: Forest Resources 528 and 544, or equivalents. 2 lectures, 1 laboratory, 3 credits.

**654. WOOD PRODUCTS MANUFACTURE AND MARKETING**

A study of wood products manufacturing processes with emphasis on plant management and marketing problems of the wood using industries. Plant visits are employed as a basis for study. Mr. Hill. Prerequisite: Forest Resources 426. 2 lectures, 1 laboratory, 3 credits.

**660. FOREST PROTECTION**

Principles of protection from fire, insects, fungi, climatic extremes, and other injurious agencies. Principles are illustrated by protection problems of northeastern forests. Emphasis is placed upon the development of resistant forest stands. Mr. Weyrick. Prerequisite: Entomology 506, or Botany 751, or equivalent. 2 lectures, 1 laboratory, 3 credits.

**661. FOREST MANAGEMENT**

The management of forest areas on an economic and ecological basis. The integration and application of business methods and the technical phases of forestry. Mr. Weyrick. Prerequisite: Forest Resources 543, 629, 660. 3 lectures, 1 laboratory, 4 credits.

**671, 672. INVESTIGATIONS IN FORESTRY**

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|-----------------------|----------------------|
| 1. Forest Ecology     | 6. Forest Economics  |
| 2. Photogrammetry     | 7. Forest Management |
| 3. Forest Utilization | 8. Logging Economics |
| 4. Game Management    | 9. Recreation        |
| 5. Mensuration        |                      |

Work to be arranged according to the needs of individual students. Staff. Prerequisite: permission of instructor. Hours to be arranged. 2-4 credits.

### 711. STATISTICAL METHODS II

An intermediate course in statistics. All students elect applied phase with basic phase optional for additional credit. Applied phase presents concepts of statistical models, tests of significance, analysis of variance in one-way and multiway classifications, and factorial experiments. Introduction to co-variance, multiple regression, and analysis with unequal subclass numbers; introduction to chi-square tests, discrete distributions; non-parametric statistics, and sampling. Basic phase parallels and supplements applied phase; algebraic derivation of computing formulae, study of models and derivation of expected values; matrix representation of experimental design and multiple regression models; introduction to least squares. Prerequisite: an elementary statistics course. 3-4 credits.

### 730. FOREST TREE IMPROVEMENT

A consideration of the genetics of forest tree improvement with emphasis on variation in natural populations, the basis of selection of desired characters and the fundamentals of controlled breeding. The application of principles will be directed toward silviculture, management and utilization. Mr. Hocker. Prerequisite: permission of instructor. 2 lectures, 1 laboratory, 3 credits. (Alternate years; offered in 1967-68.)

### 734. FOREST FISH AND GAME

Fish and wildlife population dynamics and the theory of game management. The characteristics of important game species and management techniques useful in the northeastern forest habitat. Elective with permission of instructor. Mr. Olson. 3 lectures, 1 laboratory, 4 credits.

### 746. FOREST RESOURCES SEMINAR

Case studies of forest land units. Population trends and human needs in relation to forest land productivity for timber, wildlife, water, recreation and grazing. Organized groups involved in forest land use and management, and overall planning to help maximize forest land use and productivity for our society will be studied. Mr. Wallace. Prerequisite: Forest Resources 661. 4 credits.

### 755-756. FOREST WILDLIFE MANAGEMENT

Readings and discussions on the properties of wildlife species and the various phases of management including public relations, law enforcement, and control of undesirable species. Students should be prepared to participate in week-end field trips to game management areas in New England. Mr. Olson. Prerequisite: Forest Resources 734 or permission of instructor. 2 lectures, 1 laboratory, 3 credits.

### 758. PHOTOGRAMMETRY IN FORESTRY

Elementary principles of photogrammetry with emphasis on their application to all phases of forestry. The value and use of aerial photos in forest typing, planimetric, and topographic mapping; measurement of



area and volume estimation. Prerequisite: permission of instructor. 2 lectures, 1 laboratory, 3 credits.

### 763. FOREST RECREATION SEMINAR

The recreational use of forest lands including factors that affect demand and supply for recreation. Planning for state and local recreational use emphasizing the economic and social aspects. Mr. Wallace. Prerequisite: junior standing and permission of instructor. 2 1½-hour sessions, 3 credits.

### 764. FOREST INDUSTRY ECONOMICS

Application of business methods and economics in the establishment and operation of forest industries; planning for minimum cost operations and the profitable use of capital in forest enterprises. Mr. Wallace. Prerequisite: senior standing and permission of instructor. 2 lectures, 1 laboratory, 3 credits.

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## French and Italian

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Samuel E. Stokes, Jr., *Associate Professor and Chairman*; Clifford S. Parker, *Professor Emeritus*; Louis J. Hudon, *Professor*; Grover E. Marshall, *Assistant Professor*; Margaret J. Sullivan, *Assistant Professor*

### French (56)

New students will be assigned to the proper course on the basis of their scores on the College Board achievement test.

### 401-402. ELEMENTARY FRENCH\*

For students without previous knowledge of French. Aural-oral practice, and the study of fundamental speech patterns, reading and writing to achieve a firm basis for an active command of the language. *No credit toward a major*. 4 recitations, 1 practical drill, 2 laboratories, 4 credits. (Students who offer two or more entrance units of high school work in French will not be permitted to register for credit for French 401.)

### 503-504. INTERMEDIATE FRENCH\*

Intensive and extensive reading of complete texts of intrinsic literary and intellectual worth, formal review of the structure of the language, training in oral and written expression of ideas. Classroom discussion and papers in French. 3 recitations, 1 laboratory, 3 credits. (No credit toward a major. Open to freshmen according to score on the College Board achievement test and to students who have passed French 402 with a grade of C.)

\* No student educated in a foreign country will be permitted to register for any French course numbered 650 or below if French is the student's native language.



## French and Italian

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### 505-506. INTRODUCTION TO FRENCH LITERATURE AND THOUGHT\*

Reading and analysis of significant works in French literature and thought, beginning in the 17th Century. Outside readings on the historical and cultural background of the works read. Papers and discussion in French. Term paper in English. 3 credits. Open to freshmen according to score on the College Board achievement test.

### (514). FRENCH GRAMMAR AND SPEECH HABITS\*

Thorough study of the structure of the French language and practice of basic speech patterns. 3 credits. *No credit toward a major.* Prerequisite: French 506, but may be taken concurrently with French 506.

### 605-606. READINGS IN FRENCH LITERATURE

Intensive readings in French literature from the Middle Ages to the present day. Papers and discussion in French. This course is primarily intended for sophomores and it will treat works and periods not covered in French 503-504 or French 505-506. Open to students who have received a grade of C or better in French 504 or 506. 3 credits.

### 685-686. JUNIOR YEAR AT DIJON UNIVERSITY

A program of studies at the University of Dijon (France) for juniors who have completed their sophomore year at the University of New Hampshire and have passed with a grade of B or better French 605-606 and French 514. Students interested in the program are expected to take courses in French in both their freshman and sophomore years. The students chosen for the program will be required to take a non-credit orientation course during the second semester of their sophomore year to prepare them for French university life. Students who begin French at New Hampshire may qualify for the Dijon program by taking the following sequence: French 401-402; 503-504; and 605-606 in the Summer Session. Interested students should consult with the director of the program, Professor Louis J. Hudon. 32 credits. *Not offered for graduate credit.*

### 695, 696. HONORS WORK IN FRENCH

For seniors writing a research paper in the Honors program in French. Prerequisite: permission of department chairman. Variable credit.

### 741. FRENCH LITERATURE OF THE MIDDLE AGES

Readings in the epic, lyric poetry, romance and theater. Required of senior French majors. Conducted in French. Prerequisite: French 606. 3 credits. (Alternate years; offered in 1967-68.)

### 742. FRENCH LITERATURE OF THE RENAISSANCE

Rabelais, Marguerite de Navarre, Ronsard, Du Bellay, Montaigne and

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\* No student educated in a foreign country will be permitted to register for any French course numbered 650 or below if French is the student's native language.

others. Conducted in French. Prerequisite: French 606. 3 credits. (Alternate years; offered in 1967-68.)

### 759-760. FRENCH LITERATURE OF THE SEVENTEENTH CENTURY

759: Historical and literary background of French Classicism; poetry, Corneille, Pascal, and Molière's early plays. 760: Molière, Racine, La Fontaine, Mme. de La Fayette, Boileau, and La Bruyere. Conducted in French. Prerequisite: French 606. 3 credits. (Alternate years; not offered in 1967-68.)

### 761-762. EIGHTEENTH CENTURY FRENCH LITERATURE AND THOUGHT

761: Precursors of Age of Enlightenment — Bayle, Fontenelle, Montesquieu; Voltaire's early works; Marivaux and others. 762: Diderot, Encyclopedists, later Voltaire, Laclos, Rousseau, and others. Conducted in French. Prerequisite: French 606. 3 credits. (Alternate years; not offered in 1967-68.)

### 767-768. NINETEENTH CENTURY FRENCH LITERATURE

767: Romanticism: Mme. de Staël, Chateaubriand, Lamartine, Hugo, Vigny, Musset. 768: Late Romanticism; Realism; Stendahl, Balzac, Flaubert; Hugo, the Parnassian school. Conducted in French. Prerequisite: French 606. 3 credits. (Alternate years; offered in 1967-68.)

### (770). INTRODUCTION TO MODERN FRENCH POETRY

Baudelaire, Rimbaud, Mallarmé, Valéry and others. Prerequisite: French 606. 3 credits. (Alternate years; offered in 1967-68.)

### 781-782. CONTEMPORARY FRENCH NOVEL AND THEATER

781: Maeterlinck, Claudel, Apollinaire, Gide, Proust, Mauriac, and others. 782: Malraux, Bernanos, Sartre, Camus, Anouilh, Giraudoux and others. Conducted in French. Prerequisite: French 606. 3 credits. (Alternate years; not offered in 1967-68.)

### 788. SEMINAR IN FRENCH LITERATURE

A careful study and discussion of two authors, a genre or a theme. Prerequisite: French 606. 3 credits. (Alternate years; offered in 1967-68.)

### 790. ADVANCED LANGUAGE AND STYLE

Translation of literary texts, intensive study of the principal techniques of style, *explication de textes*. Open to qualified students who have had a minimum of six hours of French courses numbered 650 and above. 3 credits.

### 795, 796. SPECIAL STUDIES IN FRENCH LANGUAGE AND LITERATURE

Individual guided study in special topics, with training in bibliography and organization of material. Examples of topics which may be selected are: the work of a major French author, specific topics in any area of French literature, such as literary criticism in the 17th Century. Staff. Prerequisite: permission of the department chairman. Variable credit.

## Geology and Geography

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### Italian (59)

New students will be assigned to the proper course on the basis of their scores on the College Board achievement test.

#### 401-402. ELEMENTARY ITALIAN\*

For students without previous knowledge of Italian. Aural-oral practice, and the study of fundamental speech patterns, reading and writing to achieve a firm basis for an active command of the language. 4 credits. (Students who offer two or more entrance units of high school work in Italian will not be permitted to register for credit for Italian 401.)

#### 503-504. INTERMEDIATE ITALIAN\*

Intensive and extensive reading of texts of intrinsic literary and intellectual worth: Dante, Petrarca, Leopardi, and others. (Open by placement examination, and to students who have passed Italian 402 with a grade of C.) 3 credits.

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## Geology and Geography

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Herbert Tischler, *Professor and Chairman*; T. Ralph Meyers, *Professor*; Donald H. Chapman, *Professor*; Cecil J. Schnee, *Professor*; William H. Wallace, *Professor*; Glenn W. Stewart, *Associate Professor*; Henri E. Gaudette, *Assistant Professor*; Robert G. LeBlanc, *Instructor*

### Geology (51)

#### 401-402. PRINCIPLES OF GEOLOGY

The earth and its history. A consideration of land forms and a discussion of the materials and structures of the earth's crust. The interpretation of past geologic events, and their effect on the development of life forms. Staff. 3 lectures, 1 laboratory, 4 credits. *No credit toward a major.*

#### 407. GENERAL GEOLOGY

An introductory course in physical geology. The structures and materials of the earth's crust and the forces which have produced and altered them. Mr. Stewart. For students in Technology. *Open to others by permission of instructor only.* 2 credits. (Not available for credit after completing Geology 401.) *No credit toward a major.*

#### 501. INTRODUCTION TO OCEANOGRAPHY

Descriptive and regional oceanography covering the physical, chemical, biological, and geological aspects of the sea. 3 credits.

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\* No student educated in a foreign country will be permitted to register for any course numbered 650 or below if Italian is the student's native language.

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### 512. DESCRIPTIVE AND DETERMINATIVE MINERALOGY

The physical and chemical properties of minerals, their associations, modes of occurrence and uses; with training in their identification. Mr. Meyers. Prerequisite: Geology 402 or 407, or Chemistry 402 or 404. 2 lectures, 2 laboratories, 4 credits.

### 531. STRUCTURAL GEOLOGY

The structural units of the earth's crust and the mechanics of their formation. Mr. Stewart. Prerequisite: Geology 402 and Mathematics 407-408, or permission of instructor. 3 lectures, 1 laboratory or field work, 4 credits.

### 552. INVERTEBRATE PALEONTOLOGY

The classification evolution, and stratigraphic occurrence of invertebrate animals as recorded by fossils. Field trips will be made to collect specimens and to study environments of living and fossil material. Mr. Tischler. Prerequisite: Geology 402 or permission of instructor. 3 lectures, 1 laboratory, 4 credits.

### 561. GEOMORPHOLOGY

The factors producing the present aspect of the land surface, particularly that of New England. Special emphasis on the work of running water, glaciers, and marine agents. Field trips during the fall season. Mr. Chapman. Prerequisite: Geology 402 or permission of instructor. 3 lectures, 1 laboratory, 4 credits.

### 613. PHYSICAL AND CHEMICAL MINERALOGY

An introduction to the theory of natural solids; the structure of the atom; the crystal, its geometry, its physics and chemistry, its natural history; methods of physical-chemical mineralogy. Mr. Schnee. Prerequisite: Chemistry 404. 2 lectures, 1 laboratory, 3 credits.

### 622. ELEMENTS OF PETROLOGY

The origin, modes of occurrence, and classification of rocks. Mr. Stewart. Prerequisite: Geology 402. 2 lectures, 1 laboratory or field exercise, 3 credits.

### 632. FIELD GEOLOGY

Training in basic field methods of geologic mapping. Mr. Stewart. Prerequisite: Geology 531. 1 lecture, 1 laboratory or field work, 2 credits.

### 662. GLACIAL GEOLOGY

The characteristics of existing glaciers and an interpretation of Pleistocene glacial features. The abundant and varied evidence of glaciation in northeastern North America and Baltic Europe will be emphasized. New Hampshire examples of both Alpine and Continental glaciation will be studied in the field. Mr. Chapman. Prerequisite: Geology 402. 2 lectures, 1 laboratory, 3 credits.

## Geology and Geography

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### 699. SENIOR THESIS

Open to students during their last semester in residence while completing their senior thesis. May not be taken by students who elect a senior comprehensive examination in place of the senior thesis. Satisfactory completion of the senior thesis represents satisfactory completion of the course. No letter grade will be given. 2 credits.

### 716. MINERALOGY OF CLAYS

The composition of various types of clays; the structure and properties of clay minerals; the origin and mode of occurrence of the clay minerals and clay materials; the utilization of clays in the arts and industry. Mr. Gaudette. Prerequisite: Geology 613, 512 or permission of instructor. 2 lectures, 1 laboratory, 3 credits.

### 741. PRINCIPLES OF GEOCHEMISTRY

The chemical approach to the interpretation of geological processes with emphasis on the principles which control the distribution and migration of elements in geological environments. Mr. Gaudette. Prerequisite: Geology 613 or permission of instructor. 3 credits.

### 754. SEDIMENTOLOGY

The properties of sediments and sedimentary rocks, the sedimentary processes and environments, correlation procedures and stratigraphic principles. Mr. Tischler. Prerequisite: Geology 401 and 512 or permission of instructor. 2 lectures, 1 laboratory, 3 credits.

### 771-772. ECONOMIC GEOLOGY

First semester: the types of coal and their occurrence in the United States; petroleum, the structures in which it is found and the distribution and geology of oil fields, especially in the United States; industrial minerals and their utilization. Second semester: the metals, their ores, and the geology of important ore deposits. Mr. Meyers. Prerequisite: Geology 512. 3 credits.

### 781. PHYSICAL GEOLOGY

The materials and structures of the earth and the erosive agents that modify them are described in the lectures and are examined and studied in the laboratory and on field trips. This course is for high school science teacher who needs an introduction to the earth sciences. (Not available for credit after completing Geology 401 or equivalent.) It will only be offered during Summer Sessions and in Extension. To register one must be a certified science teacher with at least three years of teaching experience. 4 credits.

### 782. HISTORICAL GEOLOGY

The history and development of the physical features of the earth and the development of life on the earth. Fossil organisms will be briefly surveyed in the laboratory and the methods of historical geology will be



illustrated in the laboratory and on field trips. Prerequisite: Geology 781 or equivalent. This course is for high school science teachers who need an introduction to the earth sciences. (Not available for credit after completing Geology 402 or equivalent.) It will only be offered during Summer Session and in Extension. To register one must be a certified science teacher with at least three years of teaching experience. 4 credits.

### 795. GEOLOGICAL PROBLEMS

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|---------------------------------|----------------------------------|
| 1. Areal Geology                | 11. Mineralogy, Advanced         |
| 2. Geochemistry                 | 12. Optical Crystallography      |
| 3. Geomorphology, Advanced      | 13. Ore Deposits                 |
| 4. Geophysics                   | 14. Paleontology, Advanced       |
| 5. Glacial Geology, Advanced    | 15. Petrology, Advanced          |
| 6. Groundwater Geology          | 16. Regional Geology             |
| 7. Historical Geology, Advanced | 17. Sedimentation                |
| 8. Industrial Minerals          | 18. Stratigraphy                 |
| 9. Micropaleontology            | 19. Structural Geology, Advanced |
| 10. Mineral Fuels               |                                  |

Special problems by means of conferences, assigned readings, and field or laboratory work, fitted to individual needs from one of the areas listed above. Staff. Prerequisite: permission of instructor. 1-2 credits. *This course may be repeated to a total of not more than 5 credits.*

### 797. GEOLOGY SEMINAR

Study of selected topics in both classical and modern geological thought. Prerequisite: senior standing and permission of instructor. 2 credits. (Course not offered regularly.)

## Geography (50)

### 401, 402. REGIONAL GEOGRAPHY OF THE WORLD

A survey of the geography of the world, organized in terms of the major cultural areas of the earth. The Polar, European, and Dry World cultural areas are considered during the first semester; the Oriental, African, Pacific, and New World cultural areas are analysed during the second semester. In each area the unique integration of physical and human features that produces the distinctive character of the region is studied. Mr. Wallace and Mr. LeBlanc. 3 credits.

### 471, 472. PHYSICAL GEOGRAPHY

A systematic study of the earth in terms of climates, landforms, vegetation, and soils. Cartography, weather, and climate are studied in Geography 471. Landforms, vegetation, soils, and the integration of physical features in selected areas are studied in Geography 472. Mr. Wallace and



## Geology and Geography

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Mr. LeBlanc. 2 lectures, 1 laboratory, 3 credits. (Alternate years; not offered in 1967-68.)

### 473, (473). THE WEATHER

The interpretation of atmospheric phenomena; the heating and circulation of the atmosphere and the nature and movement of the air masses which influence the weather of North America and particularly of New England. Mr. Chapman. 2 credits.

### 511. GEOGRAPHY OF ANGLO-AMERICA

A regional and topical analysis of the United States and Canada. Physical features and human phenomena are studied in terms of their contributions to the character of the area. Mr. Wallace. Prerequisite: Geography 402, or permission of instructor. 3 credits. (Alternate years; not offered in 1967-68.)

### 531. GEOGRAPHY OF WESTERN EUROPEAN AND THE MEDITERRANEAN

A regional and topical analysis of the geography of Western Europe and the Mediterranean region. Major topics studied include: the patterns of landforms, climates and vegetation; the distribution of races, languages and religions, and the significance of these factors in Western Europe. Most of the course is devoted to the analysis of the following areas: the British Isles, Northern Europe, the Low Countries, Germany, Alpine Europe, France, and Mediterranean Europe. Mr. Wallace. Prerequisite: Geography 401 or permission of instructor. 3 credits. (Alternate years; offered in 1967-68.)

### 532. GEOGRAPHY OF THE U.S.S.R. AND EASTERN EUROPE

A systematic analysis of the Soviet Union and the Communist Bloc countries with an emphasis on the former. Topics include natural regions, population, ethnography, agriculture, manufacturing, transportation, and trade. The contemporary pattern of population and the location of economic activity are viewed from the perspectives of historical process, the physical resource base, and the economic ideology of Communism. Mr. LeBlanc. Prerequisite: Geography 401 or permission of instructor. 3 credits. (Alternate years; offered in 1967-68.)

### 570. CLIMATOLOGY

The description, analysis, and interpretation of the climates of the world. A knowledge of the basic meteorological processes is assumed. Major topics covered include: world patterns of temperature, precipitation, pressure and winds, and the causes of these patterns; local weather and storm types; new concepts in meteorology and their application to climatology; problems of climatic classification and the major systems of climatic classification. Mr. Wallace. Prerequisite: Geography 471 or 473, or permission of instructor. 2 lectures, 1 laboratory, 3 credits. (Alternate years; offered in 1967-68.)

### 581. CULTURAL GEOGRAPHY

The geographic pattern of mankind. The differentiation of the world in terms of population, race, language, religion, and the basic economic activities. Emphasis is placed on the historical origin and diffusion of these phenomena as well as their significance in understanding the contemporary culture map of the world. Mr. LeBlanc. 3 credits.

### 582. ECONOMIC GEOGRAPHY

Differentiation of the earth in terms of economic activities, including agriculture, extractive industries, manufacturing, trade, and transportation, and the various tertiary activities. Location theory, the measurement of location and areal association are also important topics in this course. Diffentions in regional levels of economic development are also studied. 3 credits.

### 795. SPECIAL PROBLEMS IN GEOGRAPHY

Special problems by means of conferences, assigned readings, and laboratory work, fitted to individual needs. Mr. Wallace and Mr. LeBlanc. Prerequisite: permission of instructor. 1-5 credits. *This course may be repeated to a total of not more than 5 credits.*

### 797. SEMINAR IN GEOGRAPHY

An integration of the various fields of geography, an introduction to the history and methodology of geography, and an introduction to the research techniques of the discipline. Major topics include the history of geographic thought, source materials and methods of geographic archival research, problems of cartographic representation, statistical techniques in geography, geographic field techniques, and the definition of research problems in geography. Students will prepare short research papers and select topics for independent study the following semester. Course intended primarily for seniors majoring in geography. Mr. Wallace and Mr. LeBlanc. Prerequisite: permission of instructor. 3 credits.

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## German and Russian

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Hermann W. Reske, *Professor and Chairman*; Thomas O. Brandt, *Professor*; Alexander P. Danoff, *Assistant Professor*; Karl S. Arndt, *Assistant Professor*; Ursula D. Lawson, *Assistant Professor*; Judith M. Oloskey, *Assistant Professor*; Hildegard S. Reske, *Lecturer*

### German (57)

New students will be assigned to the proper course on the basis of their scores on the College Board achievement test.

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### 401-402. ELEMENTARY GERMAN\*

For students without previous knowledge of German. Aural-oral practice, and the study of fundamental speech patterns, reading and writing to achieve a firm basis for an active command of the language. 5 recitations, 2 laboratories, 4 credits. *No credit toward a major.* Students who offer two or more entrance units of high school work in German will not be permitted to register for credit for German 401.)

### 501-502. GERMAN COMPOSITION AND GRAMMAR REVIEW\*

A systematic review of German grammar and syntax. Concentration on the writing of compositions of gradually increasing difficulty, proceeding from concrete observations to theoretical and abstract discussion. 3 recitations, 1 laboratory, 3 credits. Open by placement examination, and to students who have passed German 402 with a grade of C. Students making a grade of A in German 502 may take courses numbered 750 and above with the permission of the department chairman.

### 507-508. ORAL PRACTICE IN GERMAN\*

A systematic course in oral self-expression, stressing enunciation and intonation. Prepared and extemporaneous talks, dialogues and group discussions. 2 recitations, 1 laboratory, 2 credits. Open by placement examination, and to students who have passed German 402 with a grade of C. Students making a grade of A in German 508 may take courses numbered 750 and above with the permission of the department chairman.

### 605-606. INTRODUCTION TO GERMAN LITERATURE\*

Reading and analysis of works selected from the most important periods in German literature. Outside readings on the historical and cultural background of the works read. Papers and discussion in German. Term paper in English. 3 credits. This course or its equivalent is prerequisite to all higher courses in German. Open to students who have achieved a grade of C or better in German 507-508, and by placement examination. Open also to students who have received a grade of C or better in German 501-502 and who have permission of the department chairman.

### 685-686. JUNIOR YEAR AT MARBURG UNIVERSITY

A program of studies at the University of Marburg (West Germany) for students at the University who have completed their sophomore year and have passed with a grade of B or better German 502 or the equivalent. Those applying will be expected to attend regularly during the semester preceding their year abroad a non-credit orientation seminar. Interested students should consult with the director of the program, Professor Hermann W. Reske. 32 credits. Students must be approved for this program.

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\* No student educated in a foreign country will be permitted to register for any German course numbered 650 or below if German is the student's native language.

### 695, 696. HONORS WORK IN GERMAN

For seniors writing a research paper in the honors program in German. Prerequisite: permission of department chairman. Variable credit.

### 755. GERMAN LITERATURE OF THE AGE OF THE BAROQUE

German literature between Reformation and the Age of Enlightenment. Reading, interpretation, and critical analysis of prescribed prose, drama and poetry with emphasis on the philosophical and social ideas of the time. Prerequisite: German 605, 606. 3 credits, 4 credits for honors. Alternate years offered in 1967-68.)

### 756. GERMAN LITERATURE OF THE AGE OF ENLIGHTENMENT

German literature from the Baroque period to the beginning of the period of Storm and Stress with emphasis on readings and interpretations of works of Lessing and Wieland. Prerequisite: German 605, 606. 3 credits, 4 credits for honors. (Alternate years; offered in 1967-68.)

### 757-758. THE AGE OF GOETHE

German literature of Storm and Stress and the Classical Period. Interpretation and critical analysis with emphasis upon selected works of Wagner, Klinger, Lenz, Schiller, and Goethe. Prerequisite: German 606. 3 credits, 4 credits for honors. (Alternate years; offered in 1967-68.)

### 759-760. GERMAN ROMANTICISM

German literature from the end of the Eighteenth century to 1830. Interpretation and critical analysis of prescribed prose, drama, and poetry of prominent writers and poets of the period, from Wackenroder to Eichendorff. Prerequisite: German 606. 3 credits, 4 credits for honors. (Alternate years; not offered in 1967-68.)

### 761-762. THE AGE OF REALISM

Representative German writers, dramatists, poets and novelists from the end of Romanticism to the beginning of Naturalism (1830-1880) will be read and discussed with a background of social and philosophical development. Prerequisite: German 606. 3 credits, 4 credits for honors. (Alternate years; not offered in 1967-68.)

### 763-764. GERMAN LITERATURE SINCE 1880

From Naturalism to the present. Reading, interpretation, and critical analysis of prescribed prose, drama and poetry of Hauptmann, Hofmannsthal, Rilke, Mann, Kafka. Prerequisite: German 606. 3 credits, 4 credits for honors. (Alternate years; offered in 1967-68.)

### 781. HISTORY AND DEVELOPMENT OF THE GERMAN LANGUAGE

An insight into the history and development of the German language. Beginning with the Indo-European Period it traces the changes in sounds, structure, and vocabulary to the establishment of modern German. Prerequisite: German 605-606. 3 credits, 4 credits for honors.

### 782. ADVANCED STYLISTICS

A systematic study of style, shades of meaning, adequacy of expression. A thorough knowledge of German grammar is prerequisite. Practice in writing seminar papers and obtaining stylistic flexibility in the use of written German. Prerequisite: German 605-606. 3 credits, 4 credits for honors.

### 795, 796. SPECIAL STUDIES IN GERMAN LITERATURE

Individual guided study in special topics, with training in bibliography, note taking, organization of material. Examples of topics which may be selected by instructor and student in conference are: (1) Wolfram von Eschenbach: Parzival, (2) Walther von der Vogelweide: Lyrics, (3) Middle High German Popular Epics, (4) German Literature of the 17th century, (5) Goethe's Poetry, (6) Goethe's Faust, (7) Heinrich v. Kleist, (8) German Romanticism, (9) 20th Century Literature. Prerequisite: permission of department chairman. Variable credit.

## Russian (61)

New students will be assigned to the proper course, on the basis of their scores on the College Board achievement test.

### 401-402. ELEMENTARY RUSSIAN\*

Elements of Russian grammar. Oral practice and written drills designed to achieve a mastery of grammatical patterns. Reading of graded prose. 5 recitations, 2 laboratories, 4 credits. (Students who offer two or more entrance units of high school work in Russian will not be permitted to register for credit for Russian 401.) No credit toward a major.

### 501-502. INTERMEDIATE RUSSIAN\*

Intensive grammar review. Oral practice stressing pronunciation and intonation. Reading of prose and practice in written expression. 3 recitations, 1 laboratory, 3 credits. Open by placement examination and to students who have passed Russian 402 with a grade of C.

### 605-606. INTRODUCTION TO RUSSIAN LITERATURE\*

Readings of selections from Russian literature with emphasis on comprehension. Conversation and composition based on the texts used. Classroom work in Russian. Background reading and term paper in English. 3 credits. Open to students who have passed Russian 502 with a grade of B or permission of instructor.

### 795, 796. SPECIAL STUDIES IN RUSSIAN LITERATURE

Individual guided study in special topics. Topics may be chosen from pre-nineteenth century literature, the Silver Age of Poetry, Poetry and Prose of the Soviet Era. Prerequisite: permission of instructor. Variable credit.

\* No student educated in a foreign country will be permitted to register for any Russian course numbered 650 or below if Russian is the student's native language.



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**Government**

(See Political Science)

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**Greek**

(See Spanish and Classics)

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**History (53)**

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William R. Jones, *Associate Professor and Chairman*; William Yale, *Professor Emeritus*; David F. Long, *Professor*; Hans Heilbrunner, *Professor*; William Greenleaf, *Professor*; Gibson R. Johnson, *Associate Professor Emeritus*; Allan B. Partridge, *Associate Professor*; Robert C. Gilmore, *Associate Professor*; Charles A. Jellison, *Associate Professor*; Marion E. James, *Associate Professor*; Robert M. Isherwood, *Assistant Professor*; Douglas L. Wheeler, *Assistant Professor*; Allen B. Linden, *Assistant Professor*, John O. Voll, *Instructor*

Students are not permitted to enroll concurrently in survey courses and advanced courses of the same area. Nor are they eligible to enroll in elementary courses after having completed advanced courses in the same area. Exemptions from this rule are possible only through petition.

**Basic Course**

The following course is required of all students.

**401, 402. INTRODUCTION TO CONTEMPORARY CIVILIZATION**

A historical analysis of the fundamental forms and forces of human societies, Western and non-Western, from the Paleolithic Age to the present. Special attention will be given to the history of science and technology, of education and learning and of artistic expression. Staff. 3 credits. *No credit toward a major.*

**Group I****503, 504. HISTORY OF THE UNITED STATES**

American history from Washington's first administration to the present. Political, social, economic, and diplomatic aspects. Mr. Jellison and Mr. Long. Not open to freshmen. 3 credits.

**707, 708. COLONIAL AND REVOLUTIONARY AMERICAN HISTORY**

Colonial beginnings in America, national rivalries, the English colonies, the Revolution, and our national life to 1789. Early forms of Americanism in the making. 3 credits.

**711, 712. NINETEENTH-CENTURY AMERICA**

The historical factors, both domestic and international, involved in the development of the American Republic, its institutions and people, from the inception of the new nation in 1789 to the emergence of the United States as a world power in 1900. Mr. Jellison. 3 credits.



# History

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## 715, 716. TWENTIETH-CENTURY AMERICA

United States history since 1896, from the triumph of industrialism on the national scene to the emergence of America as a world power in the nuclear age. Political, economic, and diplomatic developments. Mr. Greenleaf. 3 credits.

## 719, 720. THE FOREIGN RELATIONS OF THE UNITED STATES

Primarily the history of American diplomacy, with attention given to the non-diplomatic aspects of foreign relations. Mr. Long. 3 credits.

## 721, 722. SOCIAL AND INTELLECTUAL HISTORY OF THE UNITED STATES

Mr. Clark. 3 credits.

## 723. AMERICAN HISTORIOGRAPHY

An examination of the principal writings of American historians from the colonial period to the present time. Emphasis will be given to those works that pertain mainly to the American people and their immediate neighbors. Mr. Jellison. Prerequisite: permission of instructor. 3 credits.

## 725. BUSINESS HISTORY

A survey of the development of business enterprise and its institutions in Western Europe and the United States from the late Middle Ages to the era of the giant diversified corporation. Emphasis is placed on the role of the entrepreneur, the impact of public policy on business, and the case study of individual firms. Mr. Greenleaf. 3 credits.

## Group II

### 535, 536. MODERN EUROPEAN HISTORY

Europe from the end of the Middle Ages to our own times. The evolution of the national state; international relations; the expansion of Europe overseas; and the background of our modern Western civilization especially its ideas, literature and art. A basic course for those who wish to proceed further in the study of European history as well as a survey for those who are interested in special aspects of Western cultural development. Not open to freshmen. Mr. Isherwood. 3 credits.

### 559, 560. HISTORY OF ENGLAND

The history of the British Isles from earliest times to the present, and a consideration of the British Empire and Commonwealth of Nations. A parallel to English literature, a background to American political history, and a study of English culture and institutions in the democratic and social integration of the world. Mr. Partridge. Not open to freshmen. 3 credits.

### 739, 740. THREE MEDIEVAL CIVILIZATIONS

A study of the demise of classical antiquity in the lands bordering the Mediterranean and the genesis and fruition of three new cultural traditions: the Latin Christian; the Islamic; and the Byzantine. Stress will be

put on religious, literary and scholarly survivals and innovations from 400 A.D. to 1400 A.D. Mr. Jones. 3 credits.

## 743. RENAISSANCE AND REFORMATION

The history of Europe during the 15th and 16th centuries with primary emphasis on the Italian Renaissance, the Protestant Reformation, and the emergence of the national state. Mr. Isherwood. 3 credits.

## 747. THE AGE OF ABSOLUTISM

The theory and practice of absolutism from its origin in the 17th Century to its apogee in Enlightened Despotism. Mr. Isherwood. 3 credits.

## 749. THE AGE OF REVOLUTION

Revolution as a socio-political phenomenon in its historical setting. Comparative approach to Puritan, American and French Revolutions with reference to contemporary movements. Mr. Gilmore. 3 credits.

## 756. TWENTIETH-CENTURY EUROPE

European history in the 20th Century from the point of view of a civilization in a constant state of crisis. World War I, the inter-war period, World War II, and the attempts to solve the conflicts of modern society after that war in terms of new economic, political, and cultural patterns will represent the core of the study. The effects of extra-European influences, the loss of European primacy and continued strife within the structure of the European state and cultural system. Mr. Heilbronner. 3 credits.

## (759). HISTORY OF MODERN SPAIN AND PORTUGAL

The Iberian states and their peoples from the coming of nineteenth-century liberalism to the present. Political and social change will be emphasized but attention will be paid to imperial activity as well as to intellectual movements. External influences of European thought and activity will be considered as relevant to the study of two modernizing countries with persistent traditions. Mr. Wheeler. 3 credits.

## 761, 762. ENGLAND IN THE TUDOR AND STUART PERIODS

Mr. Schwarz. 3 credits.

## 763, 764. HISTORY OF RUSSIA

The development of the Russian state from its foundation to its present status as a world power. The course is designed to increase the understanding of the present in terms of the past. Political developments, foreign relations, and intellectual and ideological currents. Mr. Heilbronner. 3 credits.

## 767, 768. HISTORY OF GERMANY

Germany and the various German states from the Peace of Westphalia in 1648 to the Third Reich and the presently divided Germany. The course will emphasize the relationship and importance of Germany to the rest of Europe. Mr. Lentz. 3 credits.

## 774. EUROPEAN HISTORIOGRAPHY

An examination of selected works of historical literature since the Reformation. Emphasis will be placed on the comparison of different schools of historical interpretation, the development of historical methods, and the impact of Romanticism, Idealism, Nationalism, and Positivism on the composition of historical literature. Mr. Isherwood. 3 credits.

## Group III

### 531, 532. LATIN-AMERICAN HISTORY

The development and influence of Spanish and Portuguese culture as a widespread world force; the history of the Latin-American peoples; the relationship of Latin America to North America, particularly in view of recent growth in friendly and diplomatic relations. Mr. Partridge. Not open to freshmen. 3 credits.

### 575. THE ANCIENT NEAR EAST

A history of the Near East from the neolithic revolution to the time of Alexander the Great. Special attention will be given to the rise of civilization, the nature of man's artistic and intellectual development in the earliest civilizations of Mesopotamia and Egypt, and Judaism in its historical setting. Miss James. Not open to freshmen. 3 credits.

### 576. THE AEGEAN WORLD

A history of the Aegean area from Crete to the death of Alexander the Great in 323 B.C. Miss James. Not open to freshmen. 3 credits.

### 577. THE HELLENISTIC-ROMAN WORLD

History of the Ancient World from the death of Alexander in 323 B.C. to the end of Constantine's reign in 337 A.D. The course will cover major political, economic, and social developments but will give most consideration to artistic, scientific, philosophical, and religious trends — with particular emphasis on the rise of Christianity and the transformation of the classical world. Miss James. Not open to freshmen. 3 credits.

### 579, 580. THE HISTORY OF CHINA AND JAPAN

The development of Chinese and Japanese civilizations from their origins to the present. The course is intended to help the student understand how modern Chinese civilization and modern Japanese civilization reflect the conflict of traditional values of the Chinese and Japanese peoples and modern values learned from Europe and America. Mr. Linden. Not open to freshmen. 3 credits.

### 585, 586. THE HISTORY OF THE MIDDLE EAST

The history of the Middle East from antiquity to the present time. Some of the topics covered will be the genesis and expansion of Islam; the establishment of Ottoman rule; relations with European powers; and the emergence of modern nations in this area. Mr. Voll. Not open to freshmen. 3 credits.

**587, 588. THE HISTORY OF SUB-SAHARAN AFRICA**

The history of the African continent, its peoples and cultures from the neolithic period to the present time. Some of the topics covered will be the peopling of Africa; Africa's contact with the ancient world; the growth of African states and kingdoms; the impact of Islamic and European civilizations; and the establishment and destruction of European imperialism. Mr. Wheeler. Not open to freshmen. 3 credits.

**(781). HISTORY OF MODERN CHINA, 1850-1950**

A study of the modernization of China. The course will be concerned with the political, social, and cultural changes which have occurred in China from its early contacts with the West to the establishment of the Communist regime. Mr. Linden. 3 credits.

**784. HISTORY OF SOUTHERN AFRICA SINCE 1820**

A study of the struggle for political and economic control in the only region of Africa where European groups remain in power. With special attention to the development of European hegemony, the course will trace the impact of European imperialism, European settler nationalism, African nationalism, racial conflict, economic competition and industrialization, Apartheid, and Assimilation. Included will be a discussion of official American policy in this region. Mr. Wheeler. 3 credits.

**785. THE MODERN MIDDLE EAST**

A history of the Middle East from the 18th Century to the present time, with special attention given to the problems created by modernization and reform, the impact of nationalism and the appearance of new ideologies. Mr. Voll. 3 credits.

**Group IV****695, 696. HONORS PROGRAM**

An honors program involving two types of work: (1) The student pursues independent study in one or more specialized areas (according to the requirements of the existing independent study program). (2) The student attends a seminar in which he discusses the relevance of other disciplines to historical studies. He will also be given the opportunity in these seminars to discuss his own research with members of the faculty and other participating students. Prerequisite: A student must have a cumulative average of 3.0, or must show exceptional aptitude for history. Each case will be judged individually. 3 or 6 credits.

**(789). SEMINAR IN THE HISTORY OF SCIENCE**

Selected topics, conducted through special lectures, individual study, oral and written reports. The subject will vary from year to year. This course is the same as Physical Science (789). Mr. Schneer. *Cannot be used for credit in History without permission of the History Department.* Prerequisite: permission of adviser and instructor. 3 credits.

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## History

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### HISTORY-EDUCATION 791. PROBLEMS IN THE TEACHING OF HIGH SCHOOL HISTORY AND OTHER SOCIAL STUDIES

Bibliography and new interpretations of history; the social studies curriculum, past and present; aims and objectives in the social studies; selection and organization of teaching material; teaching and testing techniques. Special emphasis on teaching American history and the problems of American democracy. Open to students who have satisfactorily completed History 503, 504; six credits in other history courses, exclusive of History 401, 402; six credits from American Government. Principles of Economics, or Principles of Sociology; and Education 758. 3 credits. This course may not be used to satisfy major requirements.

### 792. ADVANCED STUDY IN THE TEACHING OF WORLD HISTORY

6 credits. (Offered in Summer Session only. Admission limited to in-service high school teachers with permission of the Department of History.)

### (793).WORLD HISTORY

The course will view history from the perspective of the experience of the whole human community. The histories of separate areas will be examined in terms of their relationship to the general historical experience of man. General subjects for consideration will be problems of interpretation, interrelationships, similarities and differences in the development of the major traditions of civilization. Students will present oral and written reports as a basis for discussions. Permission of the instructor is required. Open only to seniors majoring in history and graduate students. Mr. Voll. 3 credits.

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## Home Economics (31)

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Marjory A. Wybourn, *Professor and Chairman*; M. Elizabeth Rand, *Associate Professor*; Earl O. Goodman, *Associate Professor*; Mary E. Holder, *Associate Professor*; Carol J. Fritz, *Assistant Professor*; Marcia D. Burns, *Instructor*; Sylvia H. Marple, *Instructor*

### 407. HOME ECONOMICS PROFESSIONAL SEMINAR

Designed to help the student define and clarify professional and educational objectives and to become acquainted with the philosophy of home economics and with professional opportunities in the field. Trips will be planned to meet home economists in various positions. There will be some cost involved for transportation. 2 credits. NLG.

### (548), 548. FIELD WORK

A supervised experience which provides an opportunity for students to

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explore various professional fields. Prerequisite: permission of adviser. One or more semesters. Maximum of 6 credits.

### 695, (695). INDEPENDENT STUDY

Students who are adequately prepared to do independent work involving extensive reading and writing may select an area within the field of home economics and work under the guidance of a member of the department. Regular conferences will be planned. Prerequisite: permission of adviser. Credits to be arranged. Maximum of 3 credits in one semester.

## Child Development and Family Relations

### 415, (415). PERSONALITY AND COURTSHIP

The effects of family interaction on the personality development of the individual from birth through courtship with an emphasis on the student gaining insight into his own involvement in courtship and mate selection. 3 credits.

### 425, (425). CHILD DEVELOPMENT

The development and guidance of the child from the prenatal to the adolescent period with emphasis on the preschool child. Observation in the child development laboratory. Study of children in other situations may be included. Not open to freshmen. 3 credits.

### 527. CREATIVE ACTIVITIES FOR YOUNG CHILDREN

Techniques for meeting the needs of preschool children through their experiences in creative activities. Opportunity will be provided to experiment with materials and participate in the child development laboratory. Prerequisite: Home Economics 425 or equivalent. Open to home economics majors or by permission of instructor. 3 credits.

### 626. CHILD DEVELOPMENT: ADVANCED COURSE

A study of the young child with emphasis on infancy and early childhood. Study of children in the child development laboratory. Prerequisite: Home Economics 425 or permission of instructor. 3 credits.

### 628. PRACTICUM: PRESCHOOL PROGRAMS

Seminar and supervised experience in working with preschool children and their parents. Prerequisite: Home Economics 527 and permission of instructor. One or more semesters. Maximum of 6 credits.

### 685, (685). ONE SEMESTER AT THE MERRILL-PALMER INSTITUTE

A junior or senior student in the Department of Home Economics may attend The Merrill-Palmer Institute in Detroit, Michigan. Enrollment by application to the Department of Home Economics. 15-17 credits.

### 783, (783). FAMILY RELATIONSHIPS

A study of husband-wife, parent-child, and sibling interactions throughout the family life cycle. 3 credits.



## Home Economics

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### (792). METHODS IN FAMILY RELATIONS EDUCATION

A study of the methods and materials used in family relations education in high schools, colleges, churches, and social agencies. Prerequisite: permission of instructor. 2-4 credits.

### 795, (795). PROJECTS IN CHILD DEVELOPMENT AND FAMILY RELATIONSHIPS

The student, under the guidance of the instructor may undertake a special project in the area of the family or child development. Conferences, seminars and discussions of current research in the field. Prerequisite: senior or graduate. Permission of instructor. Credit to be arranged.

## Clothing and Textiles

### 305, (305). SKILL DEVELOPMENT WORKSHOP — CLOTHING CONSTRUCTION

Supervised workshop to increase skill in clothing construction. Projects selected to meet individual need, depending on previous experience. A student may enroll more than one semester. There will be some expense involved for materials. To be taken with Home Economics 405 or any time following. No credit.

### (404), 404. CONSUMER PROBLEMS IN TEXTILES AND CLOTHING

A study of factors which affect the availability of clothing and textile products in the market, and problems of consumer selection. Social and economic forces and textile properties are considered. 3 credits.

### 405, (405). PRINCIPLES OF CLOTHING CONSTRUCTION

The fundamental principles and processes involved in clothing construction and fitting, including an evaluation of techniques for various purposes. Application of these principles will be done through independent projects or enrollment in Home Economics 305. 3 credits.

### (560). PATTERN DESIGN TECHNIQUES

Basic principles of pattern construction and design through a combination of flat pattern and draping techniques. Development of proficiency in fitting individual figures. Prerequisite: Home Economics 405 or permission of instructor. 3 credits.

### (563). TAILORING

The study and application of tailoring principles and techniques. Advanced problems in construction. Prerequisite: Home Economics 405 or permission of instructor. 3 credits.

### 765. HISTORY OF COSTUME

A broad historical survey of western world costume from primitive times to the present. The influence of social, religious, and political conditions of the eras studied to costume evolution. 3 credits. (Alternate years; offered in 1967-68.)

### 768. SOCIO-PSYCHOLOGICAL ASPECTS OF CLOTHING

The analysis of research and theory in the social psychological aspects of clothing. An exploration and study of clothing behavior of individuals and groups. 3 credits.

### (769). ADVANCED TEXTILES

Investigation and evaluation of fiber and fabric properties. Consumer problems including economic and social implications. Prerequisite: Home Economics 404. 3 credits.

## Food and Nutrition

### (318), 318. SKILL DEVELOPMENT WORKSHOP — FOOD PREPARATION

Supervised workshop to increase skill in food preparation. Projects selected to meet individual need, depending on previous experience. A student may enroll more than one semester. There will be some expense involved for materials. To be taken with Home Economics 418 or any time following. No credit.

### (418), 418. PRINCIPLES OF FOOD SELECTION AND PREPARATION

Fundamental principles of food selection, preparation and service, including meal planning. Application of these principles may be done through independent projects or enrollment in Home Economics 318. Hotel administration students enroll for 4 credits and participate in additional laboratory periods. 3-4 credits.

### 521, (521). QUANTITY FOODS AND PURCHASING

Principles and methods of quantity food production and purchasing. Laboratory experiences in the University Dining Halls. Prerequisite: Home Economics 418. 4 credits.

### 573, (573). NUTRITION

A study of the nutrients essential to human life and well-being, their functions in metabolism, sources in food, and relationship between food habits and health. An application of this information to all stages of the family life cycle. Second semester freshmen may enroll. 3 credits.

### 674. NUTRITION IN HEALTH AND DISEASE

Dietary modification and management and the metabolic bases for nutritional therapy in the treatment of disease. Prerequisite: Home Economics 573. 3 credits.

### 771, (771). EXPERIMENTAL FOODS

Application of the experimental method to the principles underlying food preparation. Includes laboratory and individual projects. Prerequisite: Home Economics 418. 3 credits.

### 778. FOOD AND NUTRITION TRENDS AND DEVELOPMENTS

Investigation and evaluation of current problems in food production,

## Home Economics

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preparation and preservation and of current nutritional developments. Independent study of current literature. 3 credits.

### 797. NUTRITION SEMINAR

Theoretical approach to nutrient metabolism. Critical review of literature in the field of nutrition relative to the principles on which human nutrition is based. Prerequisite: Home Economics 573. 3 credits.

## Home Economics Education

### 791. METHODS IN HOME ECONOMICS EDUCATION

Home economics education in the school program, curriculum materials, methods, and resources in teaching home economics. 3 credits.

### (794), 794. SUPERVISED TEACHING IN HOME ECONOMICS

Eight weeks of supervised teaching in a school. Prerequisite: Education 757 and Home Economics 791. 7 credits.

### (798), 798. SEMINAR IN HOME ECONOMICS EDUCATION

Recent developments and problems in teaching home economics at all levels. Individuals or small groups may work on specific problems. Prerequisite: Home Economics 791 or equivalent. 2-4 credits.

## Management and Housing

### 531, (531). INTERIOR DESIGN

An application of the principles of design to living space. Economic and social factors relating to housing. 3 credits.

### (654), 654. FAMILY FINANCIAL MANAGEMENT

Management approach to personal and family financial problems in contemporary society. Factors influencing decisions in acquiring and using income. Concepts and techniques related to consumer credit, savings and investment, insurance, home ownership. 3 credits.

### (658), 658. HOME MANAGEMENT EXPERIENCES

Management principles in the operation of the home. Permission of instructor. 2-4 credits.

### 757, (757). MANAGEMENT AND DECISION MAKING IN THE FAMILY

Management related to functions of the family in society. Comparison of families with respect to goals, available resources and managerial behavior. Decision and choice as aspects of individual and group adjustments to changed situations. 3 credits.

### 796, (796). PROJECTS IN HOME MANAGEMENT

The student, under the guidance of the instructor, will undertake selected areas of study in the field of home management. Such investigations may include: (1) home management for the disabled. (2) consumer education, (3) management processes, (4) current research. Credits to be arranged.

## Hotel Administration (74)

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Richard H. Pew, *Associate Professor*; John R. Cox, *Instructor*

### 401. INTRODUCTION TO HOTEL MANAGEMENT

The scope of the hotel-motel business, both resort and transient. History of hospitality including current trends in the lodging and feeding industries. Laboratory by assignment. Mr. Cox. 2 credits.

### 410, 412, 514, 516. LECTURES ON HOTEL MANAGEMENT

Delivered by notable representatives in the hotel-motel, club, food service, institutional, student union, and allied fields. Mr. Pew. ½ credit for each course. NLG.

### 509. HOTEL AND RESTAURANT ACCOUNTING

A study of hotel and restaurant accounting systems with emphasis on internal control. Includes study and interpretation of operating statistics and financial reports. Food and beverage cost accounting is also presented. Open to hotel administration majors only. Mr. Cox. Prerequisite: Business Administration 502. 3 credits.

### 555. HOTEL OPERATION

The organization, personnel, and work of the departments; front office procedure; housekeeping. Laboratory by assignment. Mr. Pew. Prerequisite: Hotel Administration 509 or permission of instructor. 3 credits.

### 556. HOTEL ENGINEERING PROBLEMS

Basic principles of electricity and heat, laundry practices and equipment, kitchen planning and layouts, pumps and vacuum systems, water supply and use, fire protection and other mechanical problems of hotel-motel and food service operations. Mr. Pew. Prerequisite: Hotel Administration 555 or permission of instructor. 3 credits.

### 666. HOTEL PROMOTION AND SALES

The principles and practices used internally and externally for stimulating hotel and restaurant sales. Mr. Cox. Prerequisite: Hotel Administration 555. 3 credits.

### 667. STEWARDING AND CATERING

Purchasing, receiving, and control of foods and beverages. Organized as staff-type meeting for laboratory research, planning, preparation, and service of exceptional functions, including the critique. Mr. Pew. Prerequisite: Hotel Engineering 521. 3 credits.

### 669. HOTEL ADMINISTRATION PROJECT

A problems course concerned with advancing knowledge in the lodging and feeding fields. Mr. Pew. Prerequisite: senior standing and permission of instructor. 3 credits.

## Hotel Administration

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### 670. SENIOR SEMINAR

Assigned readings, followed by discussion of techniques, procedures and policies in hotels, clubs, motels, restaurants, hospitals, institutions, and student unions; contract feeding; university lodging and feeding. Mr. Pew. Prerequisite: senior standing and permission of instructor. 2 credits. Open to hotel students only.

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## Humanities (43)

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### 501-502. HUMANITIES

A course in general education involving the departments of English, French and Italian, German and Russian, Spanish and Classics, Philosophy, The Arts, and Music. It aims to develop an appreciation of literature, the various arts, and philosophy, and to give an understanding of western cultural traditions. The course will operate within an historical framework but is not intended to be an historical survey. Weekly lectures or demonstrations, readings, slides, films, recordings, class recitations, and discussion. There will be at least one museum trip each semester. Mr. Casas, Mr. Daggett, Mr. Maynard, and guest lecturers. Not open to freshmen. 3 credits.

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## Italian (See French and Italian)

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## Languages (See Languages, General; French and Italian; German and Russian; Spanish and Classics)

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## Languages, General (55)

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### 501, 502. SURVEY OF GREEK AND ROMAN LITERATURE

The masterpieces of Greek and Roman literature in translation. Through the study of literature, the students will learn about the ancient civilization from which much of our contemporary culture has come. A cultural course for the student unprepared to read the original languages but desiring acquaintance with the subject matter. A background course for majors in such subjects as English, history, Latin, or the modern languages and literatures. Not open to freshmen. 3 credits. *No credit toward a major.*

### LANGUAGE-EDUCATION 791. PROBLEMS IN THE TEACHING OF MODERN LANGUAGES IN THE HIGH SCHOOL

The special objectives, methods, and devices of modern language teach-

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ing in high school. For prospective teachers of French, German and Spanish. Prerequisite: Education 758 with grade of C or better (or one year of teaching experience) and one of the following courses: French 506, German 606, Spanish 506. 3 credits.

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## **Latin** (See Spanish and Classics)

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## **Liberal Arts (40)**

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The following courses are non-departmental.

### 651, (651). SENIOR SYNTHESIS: AMERICAN CIVILIZATION IN TRANSITION ✓

An interdisciplinary course designed to promote an awareness of some major issues facing the contemporary world. Assigned readings and weekly evening lectures by guest speakers constitute the basis for reflection and discussion in two one-hour seminar sections. Mr. Menge. Prerequisite: senior standing. 3 credits. *Open to all Colleges.*

### 695, 696. INDEPENDENT STUDY

Independent study for the College of Liberal Arts junior or senior honor student whose major department has no independent study course. Prerequisite: junior or senior with honor standing (cumulative average of at least 3.0), approval of student's supervisor, and the department. A junior may register for a total of 6 credits and a senior for a total of 12 credits. *See description of the College of Liberal Arts Honors Program.*

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## **Mathematics (84)**

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M. Evans Munroe, *Professor and Chairman*; William L. Kichline, *Professor*; Robert J. Silverman, *Professor*; Robb Jacoby, *Professor*; Shan S. Kuo, *Professor of Applied Mathematics*; James Radlow, *Professor of Applied Mathematics*; Edward H. Batho, *Professor*; Richard E. Johnson, *Professor*; Emil Grosswald, *Professor*; Shepley L. Ross, *Professor*; David M. Burton, *Associate Professor*; Richard H. Balomenos, *Associate Professor*; William E. Bonnice, *Associate Professor*; Robert O. Kimball, *Assistant Professor*; Frederick J. Robinson, *Assistant Professor*; William G. Whithoft, *Assistant Professor*; Eric Nordgren, *Assistant Professor*; Merle D. Guay, *Assistant Professor*; Samuel D. Shore, *Assistant Professor*; Roger H. Hou, *Assistant Professor*; Christopher C. White, *Assistant Professor*; Janice C. King, *Instructor*; James W. Estes, *Instructor*

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# Mathematics

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## 401-402. DIGITAL COMPUTATION PRINCIPLES I AND II

An introduction to the electronic digital computer. No previous knowledge of computers or college mathematics is assumed. 402 includes the FORTRAN language, use of the IBM 1620 system, and an introduction to the IBM 360 system. Open to any student. 1 credit.\*

## 405. INTRODUCTORY COLLEGE MATHEMATICS

Enrichment and development of the material presented in the last part of the senior high school mathematics program. Content: trigonometry, analytic geometry, theory of equations, inequalities, number systems, permutations and combinations; elementary set theory. Prerequisite: 3 entrance units in college preparatory mathematics. 3 credits.\*

## 407-408. FUNDAMENTAL MATHEMATICS

Introduction to logic, selected topics in mathematical structures; limits, continuity, introduction to calculus; finite mathematics; probability and statistical inference; theory of games. Recommended for non-technical students desiring a year's work in mathematics at the University level. Prerequisite: 3 entrance units in college preparatory mathematics. 3 credits.\*

## 411. DIGITAL COMPUTER SYSTEMS

Similar to 401-402 except this course is recommended for non-technical students. Includes concepts of the logical flow chart, essentials of computer languages, and use of available equipment. 2 credits.\*

## 421. CALCULUS B 1

Review of topics from algebra and trigonometry; introduction to differential and integral calculus. Students electing calculus will be placed in the 421-422-523 sequence or in the 425-426 sequence on the basis of an achievement test in algebra and trigonometry. Prerequisite: 2 years of algebra, 1 year of geometry,  $\frac{1}{2}$  year of trigonometry. 3 credits.\*

## 422. CALCULUS B 2

Continuation of differential and integral calculus with analytic geometry. Prerequisite: Mathematics 421. 3 credits.\*

## 425. CALCULUS A 1

First course in analytic geometry and calculus. Students electing calculus will be placed in the 421-422-523 sequence or in the 425-426 sequence on the basis of an achievement test in algebra and trigonometry. Prerequisite: 2 years of algebra, 1 year of geometry,  $\frac{1}{2}$  year of trigonometry. 4 credits.\*

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\* Does not count for major credit in mathematics.

**426. CALCULUS A 2**

Conclusion of introductory course in calculus of functions of one argument. Prerequisite: Mathematics 425. 4 credits.

**523. CALCULUS B 3**

Conclusion of introductory course in calculus of functions of one argument. Prerequisite: Mathematics 422. 3 credits.

**527. DIFFERENTIAL EQUATIONS**

Basic concepts, methods, and applications of ordinary differential equations; exact and approximate methods for solving first order equations; higher order linear equations; series solutions; systems of equations; boundary value problems. Prerequisite: Mathematics 523 or 426. 4 credits.

**528. MULTI-DIMENSIONAL CALCULUS**

Vectors, matrices and linear transformations, partial derivatives, maximum-minimum problems, implicit function theorem and applications, vector differential calculus, exterior products and multiple integrals, the generalized Stokes theorem and its classical specializations. Prerequisite: Mathematics 523 or 426. 4 credits.

**531. INTRODUCTION TO SET THEORY AND NUMBER SYSTEMS**

Fundamental concepts of logic and set theory; formal development of the rational, real; and complex number systems. Prerequisite: Mathematics 422 or 426. 3 credits.

**542. PROBABILITY**

Discrete and continuous distributions; random variables; moments; normal and Poisson distributions; the central limit theorem; laws of large numbers. Prerequisite: Mathematics 531. 3 credits.

**601-602. FOUNDATIONS OF THE NUMBER SYSTEM**

Postulates and mathematical structures. A study of various mathematical systems designed to show the nature and significance of the fundamental principles of arithmetic. Intended primarily for elementary school teachers. Prerequisite: permission of instructor. 3 credits.

**603. BASIC CONCEPTS OF ALGEBRA**

An introduction to generalization and abstraction in algebra designed primarily for prospective elementary school teachers. Prerequisite: Mathematics 602. 3 credits.

**604. INFORMAL GEOMETRY**

An introduction to the objects and methods of study in a modern treatment of Euclidean geometry designed primarily for prospective elementary school teachers. Prerequisite: Mathematics 602. 3 credits.

**629. METHODS OF APPLIED MATHEMATICS I**

Solutions of ordinary differential equations by D-operators, Laplace

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## Mathematics

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Transforms, and by series; representation of functions by definite integrals (Gamma, Beta, and error functions); Bessell functions; Fourier Series. Prerequisite: Mathematics 527. 4 credits.

### 605. FOUNDATIONS OF THE NUMBER SYSTEM

Same as 601-602 combined. Prerequisite: Consent of instructor. 6 credits.

### 606. ALGEBRA AND INFORMAL GEOMETRY

Same as 603-604 combined. Prerequisite: Mathematics 602 or 605. 6 credits.

### 630. METHODS OF APPLIED MATHEMATICS II

Vector analysis (line, surface, and volume integrals); elementary variational techniques; development of some partial differential equations of mathematical physics; solutions of partial differential equations by Laplace transforms and by Green's functions. Prerequisite: Mathematics 629. 4 credits.

### 696. INDEPENDENT STUDY

Individual study projects in various areas of mathematics as determined to be of interest and value to the student and the department. Supervision is by an appropriate faculty member. Consent of the faculty supervisor and department chairman is required. 1-6 credits.

### 698. SENIOR SEMINAR

Individual study on special topics. Preparation and presentation of reports on topics assigned. Prerequisite: senior standing in mathematics. 3 credits.

### 741. MATHEMATICAL STATISTICS I

Sampling theory; estimation of parameters; the multivariate normal distribution. Prerequisite: Mathematics 542. 3 credits.

### 742. MATHEMATICAL STATISTICS II

Testing statistical hypothesis, confidence intervals, regression and correlation, non-parametric methods, and other topics. Prerequisite: Mathematics 741. 3 credits.

### 753-754. NUMERICAL METHODS AND COMPUTERS

This course is oriented toward the use of numerical analysis on digital computers (with laboratory). Computer organization, algorithmic languages, and compilers, solution of polynomial and transcendental equations, numerical solutions of differential equations, linear systems of equations, eigenvalues and eigenvectors, polynomial interpolation, quadrature, curve fitting, discussion of errors, systems simulations, and mathematical optimization techniques. Selected algorithms will be programmed for solution on high-speed computers in the Computation Center. Prerequisite: Mathematics 401 and 527. 3 recitations, 1 laboratory, 4 credits.

**755. FUNDAMENTAL CONCEPTS OF GEOMETRY**

Systems of postulates of various geometries; geometric invariants; synthetic and analytic projective geometry; introduction to non-Euclidean geometry, topology, and the elementary differential geometry of curves and surfaces. Prerequisite: Mathematics 523 or 426. 3 credits.

**756. TOPICS IN NUMBER THEORY**

Elementary properties of integers; the Euclidean algorithm; divisibility; diophantine equations of the first degree; congruences; residue classes and the Euler function; distribution of primes; quadratic residues; diophantine equations of the second degree; selected topics in diophantine approximation and number-theoretic functions. Prerequisite: Mathematics 426 or 523. 3 credits.

**761. HIGHER ALGEBRA I**

The integers; the rational and complex number systems; congruences; polynomials; groups; rings; integral domains; fields. Prerequisite: Mathematics 531. 3 credits.

**762. HIGHER ALGEBRA II**

Vector spaces and transformation matrices and determinants. Prerequisite: Mathematics 761. 3 credits.

**767. REAL ANALYSIS I**

The real number system; elements of set theory; theory of limits; continuous functions and their properties; differentiability and the mean value theorem. Prerequisite: Mathematics 531. 3 credits.

**768. REAL ANALYSIS II**

The Riemann integral; uniform convergence; double and iterated limits; applications of double limit theorem to series, limits under the integral sign and existence theorems for differential equations. Prerequisite: Mathematics 767. 3 credits.

**771. GROUP THEORY AND PRINCIPAL IDEAL DOMAINS**

Finite groups and their applications; Galois theory; Sylow theorems; structure of principal ideal domains with applications to elementary divisor theory; unique factorization domains. Prerequisite: Mathematics 762. 3 credits.

**781. THEORY OF APPROXIMATION**

The theorems of Weierstrass on approximation of continuous functions; the Tschebycheff approximation problems; Tschebycheff polynomials; trigonometric polynomials of best approximation; interpolation; the formulas of Lagrange and Newton; trigonometric interpolation. Prerequisite: Mathematics 527. 3 credits.

**782. NON-LINEAR DIFFERENTIAL EQUATIONS**

Phase plane analysis of lineal systems and non-linear conservation sys-

## Mathematics

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tems; stability theorems; limit cycles and periodic solutions; the Van der Pol equation; the method of Kryloff and Bogoliouboff. Prerequisite: Mathematics 527. 3 credits.

### 783. INTRODUCTION TO DIFFERENTIAL GEOMETRY

A first course in the metric differential Geometry of curves and surfaces in Euclidean space. Prerequisite: Mathematics 527. 3 credits.

### 784. INTRODUCTION TO TOPOLOGY

Elementary point-set topology in metric and topological spaces, in particular the real line and plane. Prerequisite: Mathematics 761. 3 credits.

### 788. COMPLEX ANALYSIS

The complex number system; analyticity; elementary functions; Cauchy integral theorem and formulas; Taylor and Laurent series; singularities and residues; conformal mapping. Prerequisite: Mathematics 527. 3 credits.

### 791. MATHEMATICS-EDUCATION

The aims and values of secondary-school mathematics; the recommendations of the national committee on mathematics requirements, and the State Board requirements; the subject matter and the sequence in which it should be presented in both junior and senior high schools; techniques and instructional aids used in teaching secondary-school mathematics; errors, testing program, remedial teaching. Students preparing to teach mathematics in high school should register for this course — it is a prerequisite for supervised teaching in mathematics. Lectures, assigned readings and discussion. Prerequisite: Education 758 and Mathematics 523 or 426. 3 credits. May be counted as major credit only by students preparing to teach mathematics in secondary schools.

### 796. INTRODUCTION TO THEORY OF DIFFERENTIAL EQUATIONS

Existence and uniqueness theorems for ordinary differential equations; theory of linear ordinary differential equations of order  $n$ ; oscillation and comparison theorems for second order linear ordinary differential equations; first order partial differential equations; linear partial differential equations of the second order. Prerequisite: Mathematics 767. 3 credits.

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## Mechanical Engineering (85)

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Robert W. Corell, *Professor and Chairman*; Edward T. Donovan, *Professor*; E. Howard Stolorow, *Professor*; Godfrey H. Savage, *Professor*; Charles K. Taft, *Professor*; Azim Yildiz, *Professor of Mechanics*; Tenho S. Kauppinen, *Associate Professor*; Russell L. Valentine, *Associate Professor*; E. Eugene Allmendinger, *Associate Professor*; Douglas M. Norris,



Jr., *Associate Professor*; William Mosberg, *Associate Professor*; Victor D. Azzi, *Associate Professor of Mechanics*; Wayne M. Beasley, *Adjunct Professor of Materials Science*; William E. Clark, *Assistant Professor*; Wei Tseng Yang, *Assistant Professor*; John A. Wilson, *Assistant Professor*; Harvard B. Emery, *Assistant Professor of Graphics*; Robert W. Alperi, *Assistant Professor*; Elias M. O'Connell, *Instructor Emeritus*

### 405, (405). ENGINEERING GRAPHICS

Communication of engineering information and concepts by multiview drawings, pictorial views, sketches, and graphs; the fundamentals of descriptive geometry. 2 laboratories, 3 credits.

### 413. ENGINEERING GRAPHICS

Communication of engineering information and concepts by multiview drawings, pictorial views, sketches, and graphs. 1 laboratory, 1½ credits.

### 414. ENGINEERING GRAPHICS

The analysis of various engineering problems employing the fundamentals of descriptive geometry. Prerequisite: Mechanical Engineering 413. 1 laboratory, 1½ credits.

### 510, (510). MANUFACTURING PROCESSES AND DESIGN

A study of the machines and processes that are used in manufacturing and an analysis of the affect of these processes on the design of manufactured parts. Prerequisite: Mechanical Engineering 405. 3 laboratories, 3 credits.

### 511, (511). MACHINE SHOP PRACTICE

Advanced work in machine tools and their use; production methods, inspection, and quality control. Prerequisite: Mechanical Engineering 510. 2 laboratories, 2 credits.

### 522. MATERIALS I

An introduction to the structure and properties of metals, plastics, and ceramics; the influence of atomic structure on physical properties; equilibrium multiphase relations; deformation models. Prerequisite: Chemistry 401, 403, or 405. 3 credits.

### 523, (523). MECHANICS OF SOLIDS

Statics of rigid and deformable bodies; stress, strain, and constitutive laws; stress and deformation in structural elements and simple structures; elastic stability. Prerequisite: Physics 404, Mathematics 426 or Mathematics 422. 4 credits.

### 524, (524). DYNAMICS

Review of particle dynamics; kinematics and dynamics of rigid bodies; introduction to linear systems. Prerequisite: Physics 404, Mathematics 422 or Mathematics 426. 4 credits.



# Mechanical Engineering

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## 528. MATERIALS II

An introduction to the structure and properties of metals, plastics, and ceramics; the influence of atomic structure on properties; thermodynamics of structure. Prerequisite: Chemistry 401, 403, 405. 3 credits. 2 lectures, 1 laboratory, 3 credits.

## 533, (533). THERMODYNAMICS

The fundamental laws of thermodynamics and their relation to working substances. Prerequisite: Mathematics 422 or 426. 3 credits.

## 534. THERMODYNAMICS

A comprehensive study of the laws of thermodynamics and their affect on the behavior of media; microscopic thermodynamics; thermodynamics of combustion reactions; heat transmission. Prerequisite: Mechanical Engineering 533. 3 credits.

## 535. APPLIED THERMODYNAMICS

The engineering method applied to problems involving thermal energy conversions; the organization, management, and reporting of experimental investigations. Prerequisite: Mechanical Engineering 533, 537. 2 lectures, 1 laboratory, 3 credits.

## 536. FLUID DYNAMICS

Introduction to the dynamics and thermodynamics of compressible and incompressible fluid flow; analysis of the behavior of fluids as expressed by hydrostatic, continuity, momentum, and energy equations. Prerequisite: Mechanical Engineering 524 and Mechanical Engineering 533. 3 credits.

## 537. MECHANICAL LABORATORY

Introduction to instrumentation and measurement of mechanical systems; design and management of experimental studies; preparation of engineering reports. Prerequisite or concurrent: Mechanical Engineering 533, 523, 524. 1 lecture, 1 laboratory, 2 credits.

## 538. MECHANICAL LABORATORY

Experimental methods in the solution of engineering problems; experimental design, data analysis, and management of experiments. Prerequisite: Mechanical Engineering 537. 1 lecture, 1 laboratory, 2 credits.

## 539. MECHANICAL LABORATORY

Experimental methods in solution of engineering problems. For electrical engineering students. Prerequisite: Mechanical Engineering 523, 524, 533. 1 laboratory, 1 credit.

## 643. MACHINE DESIGN AND ANALYSIS

The concepts of strength of materials and dynamics are developed further and applied in the analysis and design of mechanical elements and

## Mechanical Engineering

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systems. Prerequisite: Mechanical Engineering 523, 524, Mathematics 527. 3 credits.

### 653. HEAT TRANSFER

Analysis of heat transfer phenomena; steady-state and transient conduction, radiation, and convection; engineering applications are included. Prerequisite: Mechanical Engineering 534, 536, Mathematics 527. 3 credits.

### 657-658. HEAT AND POWER SYSTEMS

The utilization of thermodynamics, fluid mechanics, combustion, heat transfer, and others of the engineering sciences in the analysis and engineering evaluation of heat and energy conversion systems. Prerequisite or concurrent: Mechanical Engineering 653. 2 lectures, 1 laboratory, 3 credits.

### 663. MATERIALS II

Theoretical and experimental application of the theory of elasticity, dislocation theory, and fracture mechanics used in the determination of physical design parameters of crystalline and amorphous solids. Prerequisite: Mechanical Engineering 522. 2 lectures, 1 laboratory, 3 credits.

### 671. NAVAL ARCHITECTURE I

Introduction to naval architecture; geometry and hull form delineation; hydrostatic characteristics of floating and submerged bodies; introduction to ship strength. Computer applications to problems are also included. Prerequisite or concurrent: Mechanical Engineering 523. 3 credits.

### 691, (691). ENGINEERING ECONOMY

The principles that form the basis for making engineering decisions to obtain the most favorable economic results. Prerequisite: senior standing. 3 credits.

### 695, 696. MECHANICAL ENGINEERING PROJECT

A special study involving investigation of problems which are germane to mechanical engineering. Prerequisite: permission of department. 1-3 credits.

### 697, 698. MECHANICAL ENGINEERING SEMINAR

Study and discussion of topics related to engineering with student-faculty participation. 1 credit.

### 699. UNDERGRADUATE THESIS

Individual experience in organizing an investigation of an engineering problem and its solution. Elective for seniors in mechanical engineering. Prerequisite: permission of the department. 2 credits.

## Mechanical Engineering

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### 701. MACROSCOPIC THERMODYNAMICS

Behavior of thermodynamic systems consistent with the approach of Gibbs and Caratheodory. 3 credits.

### 726. EXPERIMENTAL MECHANICS

Experimental methods and their underlying theoretical bases are developed and applied to the measurement of stress, strain and motion. Prerequisite: Mechanical Engineering 537. 3 credits.

### 727. ADVANCED MECHANICS OF SOLIDS

Energy methods; beams on elastic foundations; introduction to thin plates and shells; elasticity; inelastic behavior; numerical methods. 3 credits.

### 728. ADVANCED DYNAMICS

The foundations of dynamics leading to Lagrange's equations and Hamilton's principle. Gyroscopic effects in mechanical systems. Vibrations. 3 credits.

### 729. KINEMATICS

The vector equations of relative motions are used to analyze mechanisms of varying complexity; graphical and analytical methods for space linkages. Prerequisite: Mechanical Engineering 524. 2 lectures, 1 laboratory, 3 credits.

### 736. ANALYTICAL FLUID DYNAMICS

A rigorous "Engineering Science" analysis of the physical phenomena of fluid flow. Topics will include potential theory, the Navier-Stokes relations, boundary layer theory and turbulence. Prerequisite: Mechanical Engineering 536. 3 credits.

### 744. MECHANICAL VIBRATIONS

Review of simple linear systems concepts; nonlinear vibrations; many degrees of freedom; introduction to continuous systems. 3 credits.

### 746. CONTROL OF PHYSICAL SYSTEMS

Theory and methods for modeling and evaluating electro-mechanical, hydraulic and pneumatic control systems. 3 credits.

### 751. GAS DYNAMICS

Basic equations of motion applied to compressible, ideal fluid flow; normal and oblique shock waves; vorticity and circulation; irrotational flow; linear approach to two-dimensional flow problems; method of characteristics. Prerequisite: Mechanical Engineering 534, 536. 3 credits.

### 755. INTERNAL COMBUSTION ENGINES

Basic science and basic engineering courses are related to engineering problems through a study of spark ignition engines. Associated laboratory gives practice in organization of personnel and equipment to con-

duct and report engineering investigations. Prerequisite: Mechanical Engineering 533. 2 lectures, 1 laboratory, 3 credits.

### 756. TURBOMACHINERY

Application of basic and engineering sciences to the engineering problems of turbomachinery; design, management, and reporting of experimental studies. Prerequisite: Mechanical Engineering 533, 536. 2 lectures, 1 laboratory, 3 credits.

### 764. X-RAY METALLOGRAPHY

Theoretical and experimental studies of x-ray diffraction and microradiography. Prerequisite: permission of instructor. 3 credits.

### 772. NAVAL ARCHITECTURE II

Hydrodynamic resistances of surface ships and submerged bodies; model testing theory; powering and propellers; use of "Standard Series" tests; introduction to ship motion, control steering, and rudders; concepts of ship design, computer application to problems. Prerequisite: permission of instructor. 3 credits.

### TECHNOLOGY 601. STATISTICAL METHODS IN ENGINEERING AND PHYSICAL SCIENCE

Methods of organizing data and statistical techniques for data analysis as applied to problems in engineering and physical science. Elementary probability theory and probability distributions. Correlation and regression analysis. Design of experiments, factorials, fraction factorials, designs for process optimization. Introduction to quality control; construction and analysis control charts for variables and attributes; statistical aspects of tolerance. 3 credits.

### TECHNOLOGY 780. ENGINEERING ANALYSIS

The basic principles and analytical methods employed in the solution of complex problems in various branches of engineering. Prerequisite: permission of instructor. 2-3 credits.

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## Microbiology (47)

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Lawrence W. Slanetz, *Professor and Chairman*; Theodore G. Metcalf, *Professor*; Galen E. Jones, *Professor*; William Chesbro, *Associate Professor*

### 501. PUBLIC HEALTH AND SANITATION

The nature and types of microbes which cause infectious diseases; the prevalence, transmission, and control of these diseases. Sanitation of water, sewage, food, and air. Community hygiene and public health administration. Mr. Slanetz. Prerequisite: Biology 401, 402 or permission of instructor. 3 credits.

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## 503. GENERAL MICROBIOLOGY

Principles of microbiology; morphology, physiology, and classification of bacteria and other microorganisms, and their relationships to agriculture, industry, sanitation, and infectious diseases. Mr. Slanetz and Mr. Chesbro. Prerequisite: Chemistry 401-402 or equivalent. 2 lectures, 2 laboratories, 4 credits.

## 600. FOOD AND SANITARY MICROBIOLOGY

Relation of microorganisms to food production; food preservation; food infections and intoxications; standard laboratory methods for the bacteriological examination of foods. Microbiology and sanitation of milk, water, sewage, air, and eating utensils. Disinfection and disinfectants. Mr. Slanetz and Mr. Chesbro. Prerequisite: Microbiology 503. 2 lectures, 2 laboratories, 4 credits.

## 701. ADVANCED MICROBIOLOGY

The growth, nutrition, and metabolism of microorganisms; consideration of cell structure and localization of function; aspects of genetic and non-genetic regulation of metabolism; study of the influence of chemical and physical factors of the environment upon microorganisms. Mr. Chesbro. Prerequisite: Microbiology 503. 2 lectures, 1 laboratory, 4 credits.

## 702. PATHOGENIC MICROBIOLOGY

The morphological, cultural, biochemical, serological, and pathogenic characteristics of microorganisms causing human and animal diseases. Mr. Metcalf. Prerequisite: 503. 2 lectures, 2 laboratories, 4 credits.

## 705. IMMUNOLOGY AND SEROLOGY

The defensive elements possessed by man and animals which serve to protect them from infectious microorganisms. The principles of serological techniques used in the recognition and identification of biological materials including microorganisms. The preparation of vaccines and the production of antisera in animals. Mr. Metcalf. Prerequisite: Microbiology 702. 2 lectures, 2 laboratories, 4 credits.

## 706. VIROLOGY

The animal and plant viruses, including bacteriophages and the rickettsiae; a consideration of techniques for the propagation and recognition of animal viruses; a study of the interactions between virus and host cell and the application to problems of plant or animal infections caused by viruses. Mr. Metcalf. Prerequisite: Microbiology 702. 1 lecture, 3 laboratories, 4 credits.

## 708. MARINE MICROBIOLOGY

Characterization of microbes in the sea as to taxonomy, physiology, ecology, and transformation of carbon, nitrogen, sulfur, and phosphorus; methods of sampling and enumeration; biogeochemistry; properties of



sea water and the marine environment. Parallels to soil microbiology will be drawn. Mr. Jones. Prerequisite: Microbiology 503 and Biochemistry. 2 lectures, 1 laboratory, 4 credits.

**761-762. CLINICAL LABORATORY METHODS**

An 11-month course in medical technology taken at the Mary Hitchcock Memorial Hospital School of Medical Technology, Hanover, New Hampshire. This course starts about June 20, and includes lectures and laboratory work in bacteriology, blood bank and serology, clinical chemistry, hematology, laboratory management and ethics, mycology, parasitology, histology, and clinical microscopy. Credits will be allowed when the University has received a transcript of the candidate's record and upon certification by the Director of the School and the Supervisor of the Medical Technology curriculum that the work has been successfully completed. This course qualifies a candidate for the examination for the Medical Technologist's Certificate administered by the Registry of Medical Technologists of the American Society of Clinical Pathologists. 32 credits. *This course cannot be taken for graduate credit.*

**795, 796. PROBLEMS IN MICROBIOLOGY**

Special problems, depending upon the training and desire of the student. Elective only upon consultation. Mr. Slanetz and staff. Credits to be arranged.

**797, 798. MICROBIOLOGY SEMINAR**

Reports and discussions on current literature and recent developments in microbiology. Mr. Slanetz and staff. Prerequisite: Microbiology 600 or 702 and permission of instructor. 1 2-hour period, 1 credit.

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## Music

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Donald E. Steele, *Professor and Chairman*; Robert W. Manton, *Professor Emeritus*; Karl H. Bratton *Professor*; John B. Whitlock, *Associate Professor*; John D. Wicks, *Associate Professor*; Irving D. Bartley, *Associate Professor*; Peter Waring, *Associate Professor*; Raymond A. Hoffman, *Assistant Professor*; Wendell E. Orr, *Assistant Professor*; Keith Polk, *Assistant Professor*; Stanley D. Hettinger, *Assistant Professor*; Paul F. Verrette, *Instructor*; Howard Williams, *Instructor*; and the following part-time Lecturers in Music: Ruth Edwards, A. Irving Forbes, Paul E. Gay, Sandra Hoffman, Meredyth Jones, Sandra Lucian, Natalo Paella, Richard B. Summers

### **Music Laboratory (63)**

Registration for musical organization courses should be completed during the registration period. These courses cannot be used to satisfy major



requirements except in the music-education and Bachelor of Music curricula. *Each participant must be registered for either credit or audit by permission of the instructor.* All music laboratory courses may be repeated.

A maximum of 8 credits earned in music laboratories may be used toward graduation.

440, (440). BAND — TECHNIQUES AND LITERATURE

The Concert Band studies and performs the finest in wind instrument literature and is open to all students on the basis of audition. Performances include campus concerts and appearances on tour throughout New England. The Marching Band is open to all students and performs during the football season at home and away games. Rehearsals of the Marching Band conclude at the end of the football season. Mr. Hettinger. Prerequisite: permission of instructor. 2 laboratories, 1 credit. NLG.

441, (441). UNIVERSITY-COMMUNITY SYMPHONY ORCHESTRA — TECHNIQUES AND LITERATURE

Open to all students and others on basis of individual tryouts. The orchestra gives several concerts of the finest symphonic literature during the year and also accompanies the vocal groups and solo instrumentalists on various occasions. Membership includes students, faculty, and members of the surrounding communities. Prerequisite: permission of instructor. 2 laboratories, 1 credit. NLG.

442, (442). WOMEN'S GLEE CLUB — TECHNIQUES AND LITERATURE

Open to all students interested in singing the finest literature in this medium and who can fulfill the requirements of a tryout. Recommended for all women voice majors. Mr. Bartley. Prerequisite: permission of instructor. 2 laboratories, 1 credit. NLG.

443, (443). THE NEWHAMPSHIREMEN — TECHNIQUES AND LITERATURE

The Male Chorus of the University. Open to all students interested in singing the finest of literature in this medium and who fulfill the requirements of a tryout. Recommended for all men voice majors. Mr. Orr. Prerequisite: permission of instructor. 2 laboratories, 1 credit. NLG.

444, (444). CONCERT CHOIR — TECHNIQUES AND LITERATURE

A choral group devoted to study and performance of the best classical and modern choral literature. Recommended for men and women voice majors. Open to all interested students. Mr. Bratton. Prerequisite: permission of instructor. 2 laboratories, 1 credit. NLG.

445, (445). TUDOR SINGERS AND CHAMBER CHORUS

A mixed choral group for studying and performing masterworks from the Renaissance to the present. The literature includes madrigals, motets, masses, cantatas. The group acts as the nucleus for larger choral-orchestral works. Mr. Waring. Prerequisite: permission of instructor. 2 laboratories, 1 credit. NLG.

446, (446). ENSEMBLE — TECHNIQUES AND LITERATURE

1) Brass; 2) Strings; 3) Woodwind. Small groups of instrumentalists organized to provide advanced students experience in such groups, plus an acquaintance with the more advanced literature in the areas. Prerequisite: permission of instructor. 2 laboratories, 1 credit. NLG.

447, (447). STRING ORCHESTRA — TECHNIQUES AND LITERATURE

Open to all students on basis of individual tryouts. This group appears at all the University-Community Symphony Orchestra concerts. The most select of string compositions are studied and played. 1 credit. NLG.

448, (448). OPERA WORKSHOP

Experience in operatic singing, acting, and production techniques is offered through performance of both complete operas and operatic excerpts. Mr. Orr. Prerequisite: permission of instructor. 1 credit. NLG.

## Applied Music (63)

Lessons in applied music are based on half-hour private instruction per week. One semester hour credit may be earned with one lesson per week; two to four semester hours of credit may be earned with two lessons per week, but only students in the Bachelor of Music curriculum are allowed to register for three and four credits. Five one-hour practice periods per credit will be sought out by the music students themselves. The special semester fee for applied music is \$25 per half-hour lesson. These fees include the use of a practice room for the required preparations.

Majors in applied music within the Business Administration curriculum are required to present 16 semester hours in applied music taken over a period of four years. Two lessons per week are required each semester. Four semester credits taken in the freshman year are regarded as prerequisite to the applied music option.

Registration in applied music courses is open to all students in the University, subject to approval by the instructor who will determine the course level. A student may register for credit in the same course in successive semesters.

461, 462. VOICE CLASS FOR BEGINNERS

To develop the basic fundamentals in voice production, such as breathing, phrasing, pure tone, resonance, posture, and the study of vocal literature through group activity with some of the finest work of the masters. A basic knowledge of the piano keyboard and ear training is necessary. Permission of instructor. Mr. Bratton. 2 credits.

463, 464. FUNCTIONAL PIANO CLASS

Piano instruction primarily for beginning students in a class. Training in the following subjects will constitute the course: pianoforte techniques and reading of music; keyboard harmony geared to the practi-

cal harmonization of grade school melodies; transposition; sight reading; improvisation. Especially for students interested in occupational therapy and elementary teacher's curricula. Beginning students in music education curriculum may take this course for 1 semester. Enrollment limited to 8. Permission of instructor. 2 credits.

### 570. PIANO

The methods of presentation and the material used vary with each pupil and his degree of advancement. With beginners, training is given in the fundamentals of pianoforte technique and in the reading of keyboard music. As early as is practicable, emphasis is placed on musical values, musicianship, and sound piano technique. For this purpose, the literature employed is selected from the masters. Musical understanding is developed and quality of performance is stressed. With the attainment of advanced technique, the student's repertory is broadened to include works of all periods of literature. Mr. Steele, Mr. Bartley, Mr. Wicks, Mr. Verrette, Mr. Waring, Mrs. Edwards. Permission of instructor. 1 or 2 lessons, 1-4 credits.

### 571. ORGAN

A thorough foundation in pedal and manual technique, including hymn playing, followed in subsequent semesters by literature chiefly from the Baroque, Romantic, and contemporary periods. Permission of instructor. Mr. Bartley, Mr. Wicks, and Mr. Waring. 1 or 2 lessons, 1-4 credits.

### 572. VIOLIN, VIOLA

The choice of literature and method in violin teaching depends entirely on the individual pupil's background and ability, therefore no single course of study is set up as a requirement for all pupils. Emphasis is placed primarily on musicianship and musical values, and the development of a sound, reliable technique as a means to that end. Technique is developed in these lessons not so much through exercise and drill as it is through the best in literature. Permission of instructor. 1 or 2 lessons, 1-4 credits.

### 573. VOICE

Instruction in voice will seek to develop those qualities which are essential for intelligent interrelations, such as correct posture, breathing, pure tone, resonance, clear enunciation, and technical facility. Each voice is given the treatment best suited to its individual needs. A higher ideal than the perfection of mere mechanical skill is sought, namely a musicianly style of singing and a thorough appreciation of the best works of the masters, both classic and modern. Mr. Bratton, Mr. Orr, and Mrs. Jones. Permission of instructor. 1 or 2 lessons, 1-4 credits.

### 574. VIOLONCELLO, STRING BASS

Objectives are based primarily on the student's ability and experience.

A general awareness of the instrument as regards technique and tone are the first essential prerequisites. These elements will gradually broaden to include the attention and cultivation of the student's musical perception and repertoire. Mr. Hoffman. Permission of instructor. 1 or 2 lessons, 1-4 credits.

575. WOODWIND

Instruction in the technique and literature for the flute, oboe, clarinet, bassoon, and saxophone. Ability and previous background determines a student's course of study. Competence in basic fundamentals of tone production, embouchure, articulation and phrasing lead to concentration in the solo and chamber music repertoire for each instrument. The development of sound musicianship through study of music representative of all periods and styles is stressed. At least one public solo performance each semester is required. Mr. Hettinger, Miss Lucian, Mr. Forbes, Mrs. Hoffman. 1 or 2 lessons, 1-4 credits.

576. BRASS

Instruction in any of the following instruments: trumpet, trombone, French horn, baritone, and tuba, or any brass instrument. Correct tone production, articulation, and musical interpretation are stressed. Mr. Whitlock, Mr. Polk, Mr. Gay, Mr. Paella. Permission of instructor. 1 or 2 lessons, 1-4 credits.

577. PERCUSSION

Snare drum rudiments. The technique, tuning and sticking of the pedal and band timpani. Cymbals and all other percussion effects (claves, maracas, triangle, tambourine, wood-block, chimes, etc.) glockenspiel, bells, or bell lyre, as well as xylophone. Mr. Whitlock. Permission of instructor. 1 or 2 lessons, 1-4 credits.

## Theory and Composition (63)

421-422. THEORY I

A composite course in theory consisting of sightsinging, ear training, dictation, and elementary harmony, both written and keyboard. Basic knowledge of the piano is necessary. Basic techniques in harmonization in four parts of basses (figured and unfigured) and soprano melodies using triads and their inversions, and secondary dominants. Attention will also be given to harmonic rhythm and modulation. Staff. 5 laboratories and a general lecture. 3 credits.

521-522. SIGHTSINGING, EAR TRAINING, DICTATION II

Further training in basic elements of music. The rhythmical and melodic phenomena of the art, development of acuity and accuracy in perception and response. Mr. Hoffman. Prerequisite: Music 421-422. 3 laboratories, 1 credit.

## Music

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### 523-524. HARMONY II

Continuation of harmonization techniques developed in THEORY I. The use of irregular resolutions; the diminished 7th; the incomplete major 9th; the complete dominant 9th; the sequence; the nondominant 7th, 9th, 11th, and 13th; the raised supertonic and submediant; the Neapolitan sixth; the four augmented 6th chords; and other chromatically altered chords. Formal and harmonic analysis of preludes in the Well-Tempered Clavier and works of the Classical and Romantic periods. Continued emphasis on keyboard harmony. Mr. Wicks. Prerequisite: Music 421-422. 2 credits.

### 525-526. CONDUCTING METHODS — BAND AND ORCHESTRA

The development of conducting — physical aspects, equipment of conductor, fundamental gestures and beats, baton techniques. The reading and analysis of full and condensed scores. Essential instrumental conducting techniques, band and orchestra literature, psychology of rehearsal. 1 credit.

### 719-720. COUNTERPOINT

First semester: Sixteenth century polyphony based on the style of Palestrina. Second semester: free instrumental counterpoint based on the styles of Bach and Handel. Twentieth century counterpoint will be discussed in the closing classes of the course. Mr. Wicks. Prerequisite: Music 523-524 or permission of instructor. 2 credits.

### 721-722. CANON AND FUGUE

Free counterpoint in three and four parts, double counterpoint, the writing of simple two-part inventions, choral preludes, etc. The canonic and fugal studies will be based largely upon the works of Bach and will have as their objective the composition of a two-, a three-, and a four-voiced fugue. Prerequisite: Music 719-720 or permission of instructor. Mr. Williams. 2 credits.

### 723-724. COMPOSITION

The various smaller harmonic forms, the variation, the rondo, and the sonata forms will serve as models for composition. Prerequisite: permission of instructor. Mr. Williams. 2 credits.

### 725-726. ORCHESTRATION AND CHORESTRATION

Instruments and methods of combining them into coherent arrangements arriving at successful balances for the band and orchestral arranger. The characteristics, range and tone quality of the instruments are fully covered and transcriptions are made. Orchestral effects are studied. Chorestration is offered during the latter part of the second semester. The techniques of writing for solo voices, for mixed voices, men's and women's voices, are taken up through the medium of arrangements, and original work. Mr. Williams. Prerequisite: permission of instructor. 2 credits.



## History, Literature, and Appreciation (63)

### 401. MUSIC APPRECIATION

Masterpieces drawn from the works of Palestrina, Bach, Handel, Haydn, and Mozart. Selections will be analyzed by the students and the instructor and played several times in the classroom. Supplementary assigned recordings at the University Library. 2 credits. (Special Summer Session course.)

### 402. MUSIC APPRECIATION

Intelligent listening through formal analysis of the irreducible minimum of great musical masterpieces. A selection of the most important works of Beethoven, Schubert, Mendelssohn, Chopin, Liszt, Brahms, Tchaikowsky, d'Indy, and many others analyzed by the students and the instructor and played several times in the classroom. 2 credits. (Special Summer Session course.)

### 403-404. INTRODUCTION TO MUSIC

A beginning listener's approach to the great music of the ages. Emphasis will be placed not only on the means of acquiring a discerning ear, but also on the presenting a broad perspective of music in relation to the history of Western civilization. For non-music majors only. Mr. Verrette and Mr. Hoffman. 3 credits.

### 405, 406. HISTORY AND LITERATURE OF MUSIC

Through analysis, performance, and reading, the course aims at a practical knowledge of the techniques of composition, styles, and forms of the principal periods in the history of music. Mr. Polk. Required of all music majors. 3 credits.

### 501. SUMMER SESSION CHORUS AND BASIC CONDUCTING

A choral group devoted to the study and performance of the best classical and modern choral literature. The basic elements of choral conducting, for elementary and secondary teachers, church choir directors, and those interested in singing. May be taken for credit or as recreation. 1 credit. (Special Summer Session course which may be repeated.)

### 502. SURVEY OF MUSIC IN AMERICA

The development of music in the United States from Colonial times to the present. The various influences, such as the English tradition, the German era, the French impressionistic influence, and finally the quest for an American style with the music of the most representative composers. 2 credits. (Not offered in 1967-68.)

### 701. MASTERS OF THE RENAISSANCE

Important composers of the fifteenth and sixteenth centuries and their works: Vittoria, Palestrina, Byrd, and others. Mr. Wicks. 2 credits.



## Music

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### 703. ROMANTIC MUSIC OF THE NINETEENTH CENTURY

The sonata form as a basis for the symphonies, concerti, chamber music, and keyboard works of Beethoven, Berlioz, Schubert, Mendelssohn, Schumann, Brahms, Franck, Chopin, and Liszt. Romantic elements contained in the development of harmony orchestration, sonority, expressive content. The rise of the short piano piece, the German art song, the symphonic poem, nationalism in music. Mr. Steele. 2 credits.

### 704. TWENTIETH CENTURY MUSIC

Music of the twentieth century, including its literature, its trends, and an analysis of techniques, styles, forms, and expression. Mr. Steele. 2 credits.

### 705. THE LIFE AND WORKS OF BEETHOVEN

The piano sonatas, symphonic works, and the string quartets. Lectures, analysis, reports, required readings, and listening. 2 credits.

### 707-708. SURVEY OF OPERA AND ORATORIO

A historical and musical survey of the opera and oratio, from their common birth, through the development of each specific form to the present day. Particular stress is given to political and religious influences. Mr. Orr. 2 credits. (Not offered in 1967-68.)

### 709, 710. SURVEY OF PIANOFORTE LITERATURE

The history and development of keyboard literature from Bach to the present. A discussion and performance of the works of Bach, the sonatas and concertos of Haydn, Mozart, Beethoven, Schubert, the Romantic composers, and of contemporary writers. Mr. Steele. 2 credits. (Not offered in 1967-68.)

### 731. MUSIC IN THE MEDIEVAL PERIOD

A study in depth of the music in medieval times. Periods considered include plainsong, music of the Mass, secular monophony, beginnings of polyphony, French and Italian ars nova. 2 credits. (Not offered in 1967-68.)

### 733. MUSIC OF THE BAROQUE

A study of early, middle, and late baroque music and its various schools. The cantatas, lute and keyboard music, the early concerto and sonata are studied in detail. The literature of Bach and Handel is investigated. Mr. Wicks. 2 credits. (Not offered in 1967-68.)

### 734. MUSIC IN THE CLASSICAL PERIOD

A study of the music of the rococo and classical periods. The following subjects will be investigated: "style galant," opera seria and opera buffa, the keyboard sonata, and the music of Haydn and Mozart. Mr. Wicks. 2 credits. (Not offered in 1967-68.)

**Music Education (64)**

The Department of Music offers a four-year curriculum for teachers of elementary and secondary school music. (See music-education curriculum.)

**551. TECHNIQUES AND METHODS IN STRINGED INSTRUMENTS**

Class-teaching of stringed instruments simulating classroom situations and methods. 2 credits.

**552. TECHNIQUE AND METHODS IN WOODWIND INSTRUMENTS**

Basic fundamentals of performance in woodwind instruments, techniques of class instruction, and an introductory study of woodwind literature. Mr. Hettinger. 3 credits.

**553. TECHNIQUES AND METHODS IN BRASS AND PERCUSSION INSTRUMENTS**

Correct tone production and technique of brass instruments and of rudimentary percussion technique. Materials and procedures for class instruction. Mr. Whitlock. 3 credits.

**751, 752. TECHNIQUES AND METHODS IN CHORAL MUSIC**

A lecture workshop course touching upon some of the problems and solutions in the organization and performance of high school and college glee clubs and community choirs. Emphasis is placed on techniques of choral conducting and rehearsal, repertory, and materials. Offered to music education students who wish to place a greater emphasis on a vocal option in the music education curriculum rather than instrumental. A student taking 751, 752 may substitute them for two of the instrumental techniques and methods courses. Mr. Bratton. 3 credits.

**753. ESSENTIALS OF MUSIC FOR THE CLASSROOM TEACHER**

A course designed to provide training in the elements and appreciation of music for application to the grade-school classroom situation. Emphasis will be placed on melodic and rhythmical accuracy, basic keyboard harmony, elementary conducting, music literature. Recommended for the grade-school teacher. No performing ability required. Mr. Steele. Prerequisite: permission of instructor. 2 credits. (Special Summer Session course; not offered in 1967.)

**754. MUSIC FOR THE ELEMENTARY CLASSROOM TEACHER**

For the non-music specialist interested in utilizing music as a means of enriching children's lives. The correlation and integration of music in the school curriculum and the basic skills and techniques necessary. Also open to music specialists and school administrators. Mr. Whitlock. 3 credits. (Summer Session course; not offered in 1967.)

**791. PROBLEMS IN THE TEACHING OF SECONDARY SCHOOL MUSIC**

The application of educational principles to the teaching and learning of music, and the organization of the music curriculum on the junior and senior high-school levels. The adolescent voice and the classification of

## Music Education

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voices; the selection of vocal and instrumental materials to fit the needs of the individual group, in order to insure the maximum growth and musical development of the students; and the building of unified concert programs. Problems of administration and management, and the relationship of the teacher to school and community. Observation of music programs in secondary schools. Mr. Whitlock. Prerequisite: Education 758. 3 lectures, 1 laboratory, 3 credits.

### 792. PROBLEMS IN THE TEACHING OF ELEMENTARY SCHOOL MUSIC

Aims, scope, and organization of materials and activities in the elementary schools in keeping with modern trends in educational philosophy. The child voice, its care and development. A demonstration of materials and methods for the various grades. Observations of elementary school music. Mr. Whitlock. Prerequisite: Education 758. 3 lectures, 1 laboratory, 3 credits.

### 793, 794. EDUCATION-MUSIC. SUPERVISED TEACHING IN ELEMENTARY AND SECONDARY SCHOOL MUSIC

Prerequisite: Music-Education 792, 791. 7 credits.

### 796. ORGANIZATION AND ADMINISTRATION OF SCHOOL MUSIC GROUPS

Problems of organizing and administering school orchestras, bands, glee clubs, choruses and small ensembles, such as objectives, motivation, schedule, discipline, equipment, programs, finances, rehearsal techniques, contests and festivals, materials, personnel selection and grades. Mr. Whitlock. 3 credits. (Special Summer Session course.)

### 797. MUSIC-EDUCATION SEMINAR — INSTRUMENTAL AND CHORAL

A study and discussion of instrumental and choral music methods in the elementary and secondary schools with emphasis given to voice and instrumental classes, as well as the development of music organization. This seminar is especially designed for classroom music teachers and supervisors of considerable experience. Opportunity will be given the class members to observe the University of New Hampshire Summer Youth Music School organizations during the sixth week. Prerequisite: Teaching experience in instrumental and/or choral music. Mr. Bratton and Mr. Whitlock. 3 credits. (Special Summer Session course; not offered in 1967.)

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## Nursing (54)

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Mary Louise Fernald, *Assistant Professor and Chairman*; Ann Manchester, *Instructor*; Marguerite F. Fogg, *Assistant Professor*

The following courses are required for students majoring in nursing. Nursing 401-402, 503-504, and 551; 602 will be offered in 1967-68.

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### 401-402. INTRODUCTION TO NURSING

An introductory course discussing the influences of the past and present and the issues of the future as they affect nursing. The role of the nurse as a professional person will be discussed. Miss Fernald. 1 credit.

### 503-504. FUNDAMENTALS OF NURSING

This course will assist the student in developing beginning skills, understanding, and knowledge of nursing. The laboratories will be experiences in hospitals designed to guide the student in planning and carrying out nursing care of people. This will be taught and supervised by University faculty. Miss Manchester. 2 lectures, 1 laboratory, 3 credits.

### 551. MEDICAL AND SURGICAL NURSING

Medical and surgical nursing will be introductory in this course. Lectures in medical and surgical conditions and the nursing care involved will be planned. Prerequisite: Nursing 503-504. 2 lectures, 2 laboratories, 4 credits.

### 602-610-621. COMPREHENSIVE NURSING

Psychiatric nursing, maternal and child nursing, public health nursing, and medical and surgical nursing will be taught during the calendar year. Lectures, discussions, and nursing laboratory experience in all areas will be planned. Nursing laboratory experience will be provided using the local hospitals, a medical center, public health agencies, and other health facilities. Comprehensive nursing will be stressed. Prerequisite: Nursing 551, 602, 14 credits; 610, 6 credits; 621, 14 credits. Total 34 credits.

### 701. REHABILITATION NURSING

Geriatric nursing, nursing of long-term illness, including rehabilitation nursing, will be included. Experience and field trips to nursing homes and rehabilitation centers will be planned. Prerequisite: Nursing 621. 3 lectures, 1 laboratory, 4 credits.

### 702. SENIOR SEMINAR IN NURSING

Responsibility of the professional nurse will be discussed, including team leadership, head nursing, responsibility as a beginning practitioner, as an individual, and as a citizen. Prerequisite: Nursing 621. 4 credits

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## Occupational Therapy (65)

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Marguerite Abbott, *Associate Professor and Chairman*; R. Virginia Bell, *Assistant Professor*; Julia M. Lowe, *Instructor*; MEDICAL LECTURERS: William Amman, M.D., *Ear, Nose Throat Conditions*; Arthur DiMambro, M.D., *Orthopedics*; Charles H. Howarth, M.D., *General Medicine, Surgery, and Chest Conditions*; Henry Wolstat, M.D., *Medical Psychiatry*; Gerald Shattuck, M.D., *Pediatrics*

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## Occupational Therapy

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The following courses are for occupational therapy students; elective for others by permission of the department chairman. Grade of 2.0 or above required.

### 411. INTRODUCTION TO OCCUPATIONAL THERAPY

Survey course of the scope and area of occupational therapy and its functions as a profession. History and philosophy of medicine reviewed, with an emerging occupational therapy philosophy as a basic frame of reference for the treatment of patients. Films, guest lecturers, and instruction trips to hospitals and clinics. Miss Lowe. 2 credits.

### 412. THERAPEUTIC CRAFTS

Therapeutic crafts and skills in selected handicrafts, such as stenciling, copper tooling, bookbinding, fly tying, basketry, cord knotting, papier-mache, and chip carving. Crafts are analyzed relative to their therapeutic suitability for patients. Individual (craft) study projects are introduced, together with the basic methods of presenting activities to patients, by demonstration and return demonstration method. Minimum laboratory fee \$6.00. Miss Bell. Prerequisite: Occupational Therapy 411 with grade of C or better. 2 laboratories, 3 credits.

### 515. THERAPUTIC CRAFTS, ADVANCED

Projects and methods in leather work;  $\frac{1}{2}$  semester. Graphic arts with emphasis on printing and silk screen techniques,  $\frac{1}{2}$  semester. Therapeutic analysis of activities will be introduced. Minimum laboratory fee \$12.00. Miss Bell. Prerequisite: Occupational Therapy 412. 2 laboratories, 3 credits.

### 516. THERAPEUTIC SKILLS, NEEDLECRAFT

Projects and methods in sewing and needlecraft activities, including machine operation, basic hand stitching, needlepoint, knitting, rugmaking, embroidery, crocheting, smocking, applique and crewel embroidery. Cost, about \$6.00, depends upon individual use of materials. Miss Lowe. Prerequisite: Occupational Therapy 412. Laboratory arranged. 3 credits.

### 522. APPLICATION OF OCCUPATIONAL THERAPY TREATMENT TO GENERAL MEDICINE AND SURGERY

Also includes cardiac and chest conditions. Special problems of sensory disturbances are presented. Conditions of special significance with pediatrics and geriatrics discussed. Miss Bell. Prerequisite: Occupational Therapy 681, Psychology 537 or Home Economics 425. 2 credits.

### 524. APPLICATION OF OCCUPATIONAL THERAPY TO PSYCHIATRIC CONDITIONS

Principles of dynamic psychiatry as applied by occupational therapy to assist in establishing an atmosphere conducive to recovery (containing minimum anxiety and maximum support) by utilizing individual and group activity programs. Miss Lowe. Prerequisite: Occupational Therapy 683, Psychology 654. 2 credits.



### 526. APPLICATION OF OCCUPATIONAL THERAPY TO PHYSICAL AND NEUROLOGICAL DISABILITIES

Techniques used in treating patients with orthopedic and neurological conditions. Cerebral palsy, poliomyelitis, and degenerative neurological conditions are presented and discussed, upon the basic principle of the application of therapeutic exercise to these conditions; to improve joint motion or muscle power; to develop coordination and improve the neuromuscular pattern of movement; and to assist the patient in adjustment, by building up a wholesome psychological climate conducive to recovery. Films, guest lecturers, demonstrations. Prerequisite: Occupational Therapy 522, 681, 623, Physical Education 562, Zoology 507, 510, 610. 3 credits.

### 681. GENERAL MEDICAL LECTURES

Etiology, pathology, symptoms, and treatment of general medicine, surgery, and chest diseases; sensory disturbances, ophthalmology, otology; overview of pediatric disabilities and common childhood diseases. Films. Dr. Charles H. Howarth, Dr. William Amman, Dr. Gerald Shattuck. Prerequisite: Zoology 507. 3 credits.

### 682. ORTHOPEDIC MEDICAL LECTURES

Etiology, pathology, symptoms, and treatment of orthopedic conditions. Films. Dr. Arthur DiMambro. Prerequisite: Occupational Therapy 681. 2 credits.

### 683. PSYCHIATRIC MEDICAL LECTURES

A basic course in medical psychiatry, including both child and adult psychiatric conditions. Etiology, symptomology, prognosis, and medical treatment of the psychoneurosis, functional psychoses, the organic reaction types, plus the various types of drug therapy, currently in use. Films. Dr. Henry Wolstat. Prerequisite: Psychology 545. 2 credits.

### 698. ADVANCED READING SEMINAR

A conference-seminar to assist the senior occupational therapy student to integrate the knowledge and skills he has acquired. The student is put into contact with a variety of ideas and modalities of social psychological-medicine, forming a frame of reference for a philosophy of professional occupational therapy. Ideas, methods, and techniques, by way of the seminar conference method. This will be followed by a plan of integrated independent study in a specific field of the student's major occupational therapy interest. Miss Bell. Prerequisite: senior standing. 3 credits.

### 702. ADMINISTRATION AND ORGANIZATION FOR HOSPITAL AND AGENCY COMMUNITY WORK

The general principles of organization and administration, which include a body of knowledge of group dynamics, supervisory practices, including employer-employee relationships, personal policies, layout of occupational



## Occupational Therapy

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therapy physical plants, floor plans, purchasing, and various methods of inventory. Prerequisite: senior standing. 2 credits.

711. CLINICAL AFFILIATION IN GENERAL MEDICINE, SURGERY, AND PEDIATRICS  
Full time — three months. No credit.

712. CLINICAL AFFILIATION IN PSYCHIATRY  
Full time — three months. No credit.

713. CLINICAL AFFILIATION IN PHYSICAL DISABILITIES AND REHABILITATION  
Full time — three months. No credit.

*All occupational therapy affiliation fees must be paid prior to entering any affiliation.*

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## Philosophy (66)

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Robert P. Sylvester, *Associate Professor and Chairman*; Donald C. Babcock, *Professor Emeritus*; Asher Moore, *Professor*; Paul Brockelman, *Assistant Professor*; Howard Press, *Instructor*

### 400. LOGIC

An introduction to the principles of good reasoning, including practice in their application. The correct use of language, the logical structure of arguments, the detection of fallacies in reasoning, and the nature of scientific method. Open to all students. 3 credits.

### 410. INTRODUCTION TO PHILOSOPHY

An examination of representative philosophies and of some of the persistent problems of philosophy. An introductory course designed to acquaint the student with the nature of philosophy and to help him think about his experience philosophically. Open to all students. 3 credits.

### 420. INTRODUCTION TO ORIENTAL PHILOSOPHY

A philosophical introduction to the systems of ideas in the Orient (Hinduism, Buddhism, Confucianism, Taoism, etc.). 3 credits.

### 500-501. HISTORY OF PHILOSOPHY

The history of Western philosophy through the study of the major figures and movements from the early Greek philosophers to the 19th Century. 4 credits. Students who are interested in advanced work in philosophy should take Philosophy 500-501 as early as possible. This course is not ordinarily open to freshmen, but freshmen who expect to major in philosophy or who intend to take advanced work in philosophy may elect the course by securing the permission of the instructor. Students who wish to register for Philosophy 501 without having taken Philosophy 500 must secure the permission of the instructor.

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**502. MEDIAEVAL PHILOSOPHY**

The philosophic thought of the Middle Ages from Augustine to Scotus but with particular emphasis upon the writing of St. Augustine and St. Thomas Aquinas. Prerequisite: Philosophy 500 or permission of instructor. (Not open to freshmen.) 4 credits. (Alternate years).

**503. 19TH CENTURY PHILOSOPHY**

An historical survey of philosophic thought in the 19th century, its emergence from 18th century thought, and its bearing upon contemporary philosophy, with particular emphasis upon major figures and movements in Germany, France, and England. Readings from such figures as Fichte, Schelling, Hegel, and Schopenhauer in German classical philosophy, Auguste Comte and Henri Bergson in French philosophy, and Herbert Spencer, Jeremy Bentham, and John Stuart Mill in English philosophy. Prerequisite: Philosophy 500-501. 4 credits.

**510. PHILOSOPHY OF RELIGION**

A philosophical study of the nature and significance of religious experience, with historical and systematic analysis of such traditional problems of philosophical theology as faith and reason, evil, and the existence of God. A part of this course will consist of an intensive phenomenological study of the religious experience and an attempt to deal with the traditional problems from this point of view. Mr. Brockelman. (Not open to freshmen.) 4 credits.

**521. PHILOSOPHY AND THE ARTS**

A consideration of contemporary works of literature, music, theatre, film, and the plastic arts, in an attempt to elicit those philosophic concerns and perspectives which dominate the present. Attention will be given to social discontent, to the impact of science and technology, and to the search for authentic personal existence. Intensive use will be made of the cultural resources of the University and the region, so there will be some expense involved. Open to all students. Mr. Moore. 4 credits.

**522. PHILOSOPHY OF ART**

The nature of art; the nature of creation and appreciation; the art media; judgments of worth; the relation of expression, form, and subject; the relevance of aesthetic experience to the larger philosophical picture. Prerequisite: Philosophy 521 or other evidence of adequate experience of at least two of the arts. 4 credits.

**530. ETHICAL THEORIES**

A study of the problems of moral philosophy through the critical examination of important traditional and contemporary theories of ethics. Mr. Sylvester. (Not open to freshmen.) 4 credits.

**535. SOCIAL AND POLITICAL PHILOSOPHY**

An examination of the distinctively philosophical problems encountered

## Philosophy

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in social and political philosophy through the study of representative figures in the history of this branch of philosophy. An essential aim of this course will be to bring the student to serious and intensive reflection upon his own social and political philosophy. Mr. Sylvester. (Not open to freshmen.) 4 credits.

### 550. SYMBOLIC LOGIC

The principles and techniques of modern logic, with special attention to their philosophic significance. Discussion of sentential calculus, class calculus, truth tables, and lower functional calculus as well as the nature of deductive systems and the problems of formal consistency. Prerequisite: Philosophy 400 or permission of the instructor. 4 credits.

### 595. TUTORIAL READING

Reading of selected books under the direction and guidance of a member of the Department of Philosophy. The books offered for tutorial reading may be in any area the instructor chooses. Offered for second semester freshmen and sophomores. 3 credits. One hour conference with the instructor per week.

### 600. PHILOSOPHY THROUGH LITERATURE

A study of the philosophical implications of representative literary works with particular emphasis on recent and contemporary literature. 3 lectures, 4 credits. (Alternate years.)

### 610. ANALYTIC PHILOSOPHY

A study of analytic philosophy, its roots in the nineteenth century, its relation to science, and its development to the present day. The application of the analytic method to the solution of philosophic problems. Readings from such recent and contemporary figures as Russell, Wittgenstein, Ayer, Carnap, and Ryle. Prerequisite: Philosophy 500-501. 4 credits. (Alternate years.)

### 615. CONTEMPORARY MOVEMENTS IN PHILOSOPHY

A study of contemporary pragmatism, neo-realism and naturalism, with their roots in 19th Century American Philosophy. Readings from such recent and contemporary figures as Peirce, James, Dewey, Santayana, Whitehead, and C. I. Lewis. Prerequisite: Philosophy 500-501. 4 credits.

### 620. EXISTENTIALISM

A study of existentialism, its roots in the nineteenth century, its relation of phenomenology, and its development to the present day. Readings from such recent and contemporary figures as Sarte, Marcel, Heidegger, and Jaspers. Prerequisite: Philosophy 500-501. 4 credits. (Alternate years.)

### 630. PHILOSOPHY OF SCIENCE

A discussion of various philosophical problems raised by science. For

example: induction and probability, the nature of law, the significance of statistical techniques, the purpose and general principles of experimental design, theory construction, operationism, the nature of mathematics and its application in science, the place of speculation in science, the unity of science, special problems of the biological and social sciences. The relation of science to ethics, the humanities, and everyday life. 4 credits. (Alternate years.)

### 650. PROBLEMS IN PHILOSOPHY

A systematic study of traditional problems in philosophy. Topics such as metaphysics, epistemology, philosophy of mind, philosophy of history, philosophy of logic, and the like may be offered in this category. Since the course covers one systematic area the semester it is offered, a student may repeat the course as long as the topic offered is one he has not already taken for credit. Prerequisite: Philosophy 500-501, or consent of the instructor. 4 credits.

### 700, (700). STUDIES IN THE HISTORY OF PHILOSOPHY

Intensive study of individual philosophers, important movements, schools, or periods in the history of philosophy. Subjects and instructors to be announced each year. Prerequisite: Philosophy 500-501. Lectures, lectures-discussion, or seminar. 4 credits. Barring duplication of subject this course may be repeated for credit.

### 701. TOPICS IN SYSTEMATIC PHILOSOPHY

Intensive study of selected problems of philosophy in such areas as epistemology, metaphysics, and theory of value. Topics and instructors to be announced each year. Prerequisite: Philosophy 500-501. Lectures, lectures-discussion, or seminar. 4 credits. Barring duplication of subject this course may be repeated for credit.

### 795, 796. INDIVIDUAL STUDY

Students who are adequately prepared to do independent work involving extensive reading and writing may do advanced work on an individual basis. Before registering for this course the student must formulate a project and secure the consent of a member of the department who will supervise his work. Conferences and/or written work as required by the supervisor. Seniors may write the senior paper for credit under this course offering. Credits to be arranged.

### Physical Education for Men (90)

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Gavin H. Carter, *Chairman, Department of Physical Education for Men, Associate Professor*; Andrew T. Mooradian, *Chairman, Department of Intercollegiate Athletics, and Associate Professor*; Carl Lundholm, *Director and Professor Emeritus*; Paul C. Sweet, *Professor*; Robert E. Wear, *Associate Professor*; Edward J. Blood, *Assistant Professor*; Walter E. Weiland, *Assistant Professor*; Robert Kertzer, *Assistant Professor*; Theodore W. Connor, *Assistant Professor*; Charles G. Arnold, *Assistant Professor*; F. William Haubrich, *Instructor*; Ruben Bjorkman, *Instructor*; Thomas Barstow, *Instructor*; Lionel J. Carbonneau, *Instructor*; Robin K. Teller, *Instructor*; Joseph M. Yukica, *Instructor*; Dwight E. Aultman, *Instructor and Physical Therapist*; M. William Bowes, *Instructor*; Irvin T. Hess, *Instructor*; John J. Hyder, *Instructor*

The Department of Physical Education for Men strives to meet the needs of college students for physical fitness, mental alertness, emotional stability, and social acceptability by providing opportunities for exercise, for self-expression, for emotional expression and for skill development in a wide variety of physical and recreational activities.

In the basic instructional program, required and elective activity courses, instruction is aimed at providing the skills, knowledges and attitudes necessary for the intelligent utilization of opportunities for active recreation while at the University and in later life.

The Department also offers a program of professional preparation for men wishing to enter the fields of physical education or recreation education.

### Requirements

A minimum of two semesters of physical education is required for men students. Freshmen men should register for Physical Education 431-432 unless they are interested in selecting physical education or recreation education as a field of concentration in which case they will take 441-442. Transfer students will register for the appropriate courses after consulting department advisers. See description below.

Each student must, before entering the University, have had a physical examination by a physician. Students with physical disabilities or limitations must register for physical education as other students. In most cases, modified activities are recommended by the University Physician. The physical therapist of the Division of Physical Education and Athletics will serve as the liaison with the University Health Service.

The standard uniform required of all students consists of blue trunks, grey sleeveless jersey, grey sox and regulation gymnasium sneakers. Students are encouraged to furnish their own individual equipment in the individual sports. Equipment is furnished for badminton, fencing, golf,



handball, lacrosse, riflery, squash and tennis. Students should check the requirements for equipment and special fees before enrollment.

### Basic Instructional Program

#### 431-432. PHYSICAL EDUCATION ACTIVITY COURSES

Required of all freshman men. These courses are organized as instruction in skills and in the principles of physical conditioning and health. Elective activities will include badminton, fencing, golf, gymnastics, handball, lacrosse, riding, riflery, skating, skiing, social dance, soccer, squash rackets, swimming, tennis, track and field, volleyball, weight training and conditioning, and wrestling. 2 hours,  $\frac{1}{2}$  credit. NLG.

#### 433, 434. ELECTIVE ACTIVITY COURSES

Additional elective activity courses may be elected by sophomores, juniors, and seniors. Activities may be chosen from those listed under Physical Education 431-432. No activity may be repeated for credit. Prerequisite: Physical Education 431. 2 hours,  $\frac{1}{2}$  credit.

#### PHYSICAL EDUCATION ACTIVITY COURSES (Specialized)

Specialized courses for students majoring in physical education providing basic skills in a variety of physical activities taught in the elementary or secondary school. Physical Education 441-442 are for freshmen; Physical Education 443-444 are for sophomores. Required of students in the physical education curriculum in lieu of Physical Education 431-432. Staff. 3 periods, 1 credit.

### Theory Courses

#### 453. PRINCIPLES OF PHYSICAL EDUCATION

The historical factors, biological, psychological and sociological principles influencing the methods and practices in health, physical education, and recreation today. The relationship of physical education to education and educational aims and objectives will be discussed. Miss Browne. 3 credits.

#### 520. PHYSIOLOGY OF EXERCISE

The acute and chronic physiological effects of exercise. Emphasis will be on respiration, circulation and energy metabolism. Lectures will be supplemented by laboratory sessions demonstrating physiological adaptation to the demands of muscular activity. Mr. Kertzer. Prerequisite: Zoology 508. 2 lectures, 1 laboratory, 3 credits.

#### 521. PROBLEMS OF COACHING BASKETBALL\*

Theory and practice in the fundamentals of individual offense and defense. The various styles of team offense and defense and rules of the

\* Students in the Physical Education Curriculum must complete no less than six of these courses and not including more than two of the Problems of Coaching courses. Students in the Academic Teaching Option must complete no less than four of these courses and not including more than two of the Problems of Coaching courses.



## Physical Education for Men

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game. Problems in handling and conditioning a team. Mr. Haubrich. Open to physical education majors only. 1 lecture, 2 laboratories, 2 credits.

### 522. PROBLEMS OF COACHING FOOTBALL\*

Analysis of various systems of play. Instruction in team and individual offensive and defensive fundamentals. The rules, theory, strategy, generalship of team play, coaching methods, physical conditioning, and rules. Football Staff. Open to physical education majors only. 1 lecture, 2 laboratories, 2 credits.

### 524. PROBLEMS OF COACHING BASEBALL\*

Theoretical and practical consideration of basic principles of batting and fielding; the fundamentals of each position; special stress on problems of team play, coaching methods, physical conditioning and rules. Mr. Conner. Open to physical education majors only. 1 lecture, 2 laboratories, 2 credits.

### 525. THEORY OF TEACHING TEAM SPORTS FOR MEN\*

Theory and practical teaching methods in the team sports which form the foundation for a broad program of physical education. Staff. Elective by permission of instructor. 2 lectures, 1 laboratory, 2 credits.

### 526. THEORY OF TEACHING INDIVIDUAL SPORTS FOR MEN\*

Theory, practical teaching methods and the development of advanced skills in the individual sports which form the foundation for a broad program of physical education. Staff. Elective by permission of instructor. 2 lectures, 1 laboratory, 2 credits.

### 527. THEORY OF TEACHING AQUATICS\*

Theory, teaching methods, and skills in swimming, diving and water safety. Mr. Arnold. Elective by permission of instructor. 2 lectures, 1 laboratory, 2 credits.

### 528. PROBLEMS OF COACHING TRACK AND FIELD\*

Instruction and practical demonstration in starting, sprinting, middle distance and distance running, relay, hurdling, high and broad jumping, pole vault, shot putting, discus, hammer and javelin throwing. Methods of preparing contestants for the various events. Mr. Sweet. Elective by permission of instructor. 1 lecture, 1 laboratory, 2 credits.

### 529. THEORY OF TEACHING GYMNASTICS AND TUMBLING\*

Theory, practical teaching methods, and advanced skills are taught including tumbling, gymnastic routines and the use of gymnasium apparatus. Mr. Weiland. Elective by permission of instructor. 1 lecture, 2 laboratories, 2 credits.

\* Students in the Physical Education Curriculum must complete no less than six of these courses and not including more than two of the Problems of Coaching courses. Students in the Academic Teaching Option must complete no less than four of these courses and not including more than two of the Problems of Coaching courses.

### 553. THEORY OF TEACHING DANCE\*

A survey of methods, materials and techniques in teaching dance. Instruction in performance and teaching rhythms, social, folk, and square dance. Miss Morrison. 2 lectures, 1 laboratory, 2 credits.

### 582. PERSONAL AND COMMUNITY HEALTH

Course deals with the individual aspects of healthful living and the problems of community health as they relate to disease prevention and control. Mr. Wear. Prerequisite: Biology 401-402. 2 credits.

### 622. FIRST AID-SAFETY: ATHLETIC TRAINING

Nature and causes of injuries incident to physical activities. The common hazards of play, and preventive measures for children and athletes are discussed. First aid principles are presented. Mr. Aultman. Prerequisite: Zoology 507. 2 credits.

### 652. KINESIOLOGY

The science of human motion with emphasis on the origin, insertion and actions of skeletal muscle. Application of selected principles of muscle physiology and mechanics to the analysis of sports skills. Mr. Kertzer and Mr. Aultman. Prerequisite: Zoology 507. 3 credits.

### 656. PROBLEMS OF HEALTH EDUCATION

A course designed to acquaint the student with methods, materials and principles of developing a broad school health program. Mrs. Wooster. Prerequisite: Physical Education 582. 3 credits.

### 665. ADMINISTRATION OF PHYSICAL EDUCATION IN SECONDARY SCHOOLS

Administrative methods in the conduct of physical, health, and recreation education. The planning of programs and policies in the light of past and present philosophies and in regard to current programs, facilities, equipment, selection of staff, and public relations. Mr. Carter. 3 credits.

### 668. MEASUREMENT PROCEDURES IN PHYSICAL EDUCATION

Procedures used in the evaluation, construction, administration, and interpretation of measurement techniques used in physical education. Essential elementary statistical methods are covered so that measurement data may be scientifically evaluated for application to the program. Mr. Weiland and Miss Knowlton. 2 lectures, 1 laboratory, 3 credits.

### PHYSICAL EDUCATION-EDUCATION 792. PROBLEMS OF TEACHING PHYSICAL EDUCATION IN THE ELEMENTARY SCHOOL

Methods, materials and organization of a comprehensive program of activities for use primarily in the elementary school. Miss Newman. 3 credits.

\* Students in the Physical Education Curriculum must complete no less than six of these courses and not including more than two of the Problems of Coaching courses. Students in the Academic Teaching Option must complete no less than four of these courses and not including more than two of the Problems of Coaching courses.

## Physical Education for Men

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### EDUCATION-PHYSICAL EDUCATION 790. DIRECTED TEACHING OF PHYSICAL EDUCATION

Opportunity for teaching physical education activities under direction in the elementary or secondary school. Mr. Barstow. Prerequisite: Physical Education-Education 792 or concurrently. 1 lecture, 2-5 hour laboratory, 6 credits.

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## Physical Education for Women (91)

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Marion C. Beckwith, *Chairman and Professor of Physical Education for Women*; Evelyn Browne, *Professor*; Caroline S. Wooster, *Associate Professor*; Barbara K. Newman, *Associate Professor*; Janet Atwood, *Assistant Professor*; Patricia Farrell, *Assistant Professor*; Jean Morrison, *Assistant Professor*; Elizabeth E. Knowlton, *Instructor*; Patricia Lalone, *Instructor*; Marilyn La Plante, *Instructor*; Nancy Small, *Instructor*; Barbara Bowes, *Part-time Instructor*; Judith B. Jones, *Half-time Instructor*

The Department of Physical Education for Women provides for each student an opportunity to participate in a program which will give her a theoretical and practical knowledge of movement concepts and an understanding of the need for physical activity in developing total fitness. The program includes a movement fundamentals course and a wide choice of sports, dance, aquatics and gymnastics courses. Club activities designed to encourage "in depth" experiences and a varsity program are also offered, sponsored jointly by the Women's Recreation Association and the Department. Individual needs are of primary concern, and opportunity for participation in a limited program is provided for those students with medical restrictions.

### Requirements and Regulations

All women students are required to complete at least one credit of a basic instructional course for each of the first four semesters they attend the University. Freshmen women (except majors) should register for Physical Education 401, 402; sophomores for Physical Education 403, 404: Freshmen interested in majoring in physical education or recreation education should elect Physical Education 411 and 412 in place of 401 and 402. In addition they should also elect Physical Education 421 and 422 for a second credit of laboratory work. A second course may be elected each semester by any student for additional credit: Physical Education 405, Physical Education 406. Unless there is an elementary and an intermediate section, the same activity shall not be credited more than twice.

Each student must, before entering, have had a physical examination by a physician. A posture test will be given by the physical education staff.

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## Physical Education for Women

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Individual gymnastics is required of each freshmen whose physical condition indicates this need. Students with physical disabilities must follow the same procedure as other students including registration for physical education. In most cases, modified activities are recommended by the University Physician. All students are expected to take the Humiston motor ability test and must take the swimming proficiency test when they enter the University.

Special gymnasium uniforms are provided consisting of black leotards and blue cotton tennis-type dress. Students are required to furnish white socks, regulation gymnasium sneakers and their own individual equipment for such activities as tennis, skiing, and skating. Equipment is furnished for golf, fencing, badminton, hockey, archery, lacrosse, riflery, and softball. The special riding fee is \$35 a quarter for two periods a week.

### Advanced Instruction

To provide for the more highly skilled student and to encourage the interest of others, regardless of ability, the Department offers in its program numerous clubs and activities in which instruction is given by a member of the teaching staff. The clubs and their instructors follow:

BADMINTON CLUB, Miss Farrell; DANCE CLUB, Miss Morrison; DURHAM REELERS, Miss Farrell; FENCING CLUB, Miss Knowlton; GYMNASTICS CLUB, Mrs. Cochrane; RIFLE CLUB, Miss Browne; SKATING CLUB, Mrs. Kertzer; SKI CLUB, Miss LaLone; SYNCHRONIZED SWIMMING CLUB, Miss LaPlante; W.R.A., Miss Farrell and staff. A RIDING CLUB is also available, Mrs. Janet Briggs, Instructor, Animal Science Department.

Women students following any teacher training curriculum are urged to elect for required physical education the following activities: folk and square dancing, recreation workshop, volleyball, hockey and basketball.

### Basic Instructional Program

#### 401. MOVEMENT FUNDAMENTALS

Designed to develop basic concepts of movement through experiences in body mechanics, dance, and gymnastics. A preparation course for further work in specific movement areas. Motor ability testing, posture analyses, fitness orientation included. Required of all freshmen women first semester. Prospective majors elect 411 and 421. 3 hours, 1 credit. NLG.

#### 402, 403, 404. PHYSICAL EDUCATION COURSES

Required of all second semester freshmen and of sophomore women. Select from list below. 3 hours, 1 credit. NLG.

#### 405, 406. PHYSICAL EDUCATION COURSES

Elective for juniors and seniors plus freshmen and sophomores desiring to take an elective. 3 hours, 1 credit. See list below.

## Physical Education for Women

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### 407, 408. PHYSICAL EDUCATION COURSES

Elective for juniors and seniors desiring to register for a second course beyond 405 or 406. 3 hours, 1 credit. See list below.

### PHYSICAL EDUCATION COURSES (Specialized)

Specialized courses for students majoring in physical education. Others by permission of instructor. 411, 412, 421, 422 are for freshmen; 413 414, 423, 424 are for sophomores; 415, 416 are for juniors; 417, 418 is for seniors. 3 hours, 1 credit.

## Basic Instructional Courses

(Elect one each quarter)

### FIRST QUARTER

Apparatus, archery (elem. + inter.), badminton, dance composition fitness lab, golf (elem. + inter.), movement fundamentals, modern dance (elem. + inter.), hockey, individual gym, riding (elem. + inter. + adv.), soccer, swimming (beg. + inter.), tennis (elem. + inter.).

### SECOND QUARTER

Basketball, badminton (elem. + inter.), dance composition, elementary games (majors), fencing, folk and square dance, movement fundamentals, gymnastics, modern dance (elem. + inter.), individual gym, riding (elem. + inter. + adv.), riflery, figure skating (elem. + inter.), skiing (beg.), social recreation (majors), stunts and tumbling, swimming.

### THIRD QUARTER

Badminton (elem. + inter.), dance composition, elementary games, fencing, folk and square dance, gymnastics, individual gym, modern dance (elem. + inter.), riding (elem. + inter. + adv.), riflery (elem. + inter.), figure skating (elem. + inter.), skiing (beg. + elem. + inter. + adv.), recreation workshop, stunts and tumbling, volleyball, swimming (beg. + inter. + Life Saving).

### FOURTH QUARTER

Archery (elem. + inter.), outdoor education, dance composition (elem. + inter.), individual gym, lacrosse, modern dance (elem. + inter.), riding (elem. + inter. + adv.), softball, swimming (beg. + inter. + Life Saving) tennis (elem. + inter. + adv.).

## Theory Courses

### 453. PRINCIPLES OF PHYSICAL EDUCATION

The historical factors, biological, psychological, and sociological principles influencing the methods and practices in health, physical education, and recreation today. The relationship of physical education to education and educational aims and objectives will be discussed. Miss Browne. 3 credits.



### 454. ORGANIZED CAMPING

The methods, objectives, and purposes of organized camping; standards, facilities, equipment, food, sanitation, health, and safety requirements; program planning and leadership qualifications; integration of camping in the public schools; basic outdoor living skills. Miss Atwood and Mrs. Wooster. Permission of instructor. 3 credits.

### 455. INTRODUCTION TO COMMUNITY RECREATION

History, trends, community organization, financial aspects of administration, program planning, and leadership of community recreation, including playgrounds. Principles and philosophy of recreation. Miss Farrell. Elective for sophomores, juniors, and seniors. 3 credits.

### 460. LEADERSHIP RECREATION

A practical study of the areas of social recreation, materials and methods of leadership in the areas of games, music, drama, etc. Creative to formal training in leadership techniques with all kinds of group recreation situations. Designed for those desiring work on playgrounds, in camps, scouts, hospital, 4-H, and other leisure time groups. 3 credits.

### 520. PHYSIOLOGY OF EXERCISE

Course provides the essential background necessary for an understanding of the response of the body to exercise. Available research data in physiological phenomena associated with exercise will be discussed and analyzed, supplemented by individual study. Mr. Kertzer. 3 credits. Prerequisite: Zoology 507.

### 553, 554. THE THEORY OF TEACHING DANCE

A survey of methods, materials and techniques in teaching dance. Includes instruction in performance and teaching of modern dance, first semester; rhythms, social, international folk and square dance, second semester. Prerequisite for 553: modern dance (elem. and inter.), for 554, folk dance. Miss Morrison. Open to physical education majors or by permission of instructor. 2 lectures, 1 laboratory, 2 credits.

### 561. NATURE RECREATION

A course that evaluates the natural phenomenon surrounding man through an acquisition of a general background in the natural and physical sciences. Current practices, leadership techniques, and activity skills would include field identification of animal, bird, fish, and insect life, tree and shrubs, terrain and geological formations, cloud, wind, and weather implications and conservation methods as they relate to man in his natural environment. 2 lectures, 1 laboratory, 3 credits.

### 563, 564. THE THEORY OF TEACHING TEAM SPORTS FOR WOMEN

The methods and principles involved in the teaching of team sports and lead-up games with emphasis on coaching methods strategy and techniques of officiating. Discussion of equipment, history, tactics, and rules



## Physical Education for Women

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of each sport. Miss Atwood. Prerequisite: Elementary courses in team sports. 2 lectures, 1 laboratory, 2 credits.

### 573, 574. THE THEORY OF TEACHING INDIVIDUAL SPORTS FOR WOMEN

The methods and principles involved in the teaching of tennis, badminton, bowling, skiing, skating, golf, and archery. The history, equipment, courtesies, rules, techniques, and strategy of each sport will be discussed. Miss LaPlante and Miss Beckwith. Prerequisite: elementary work in the courses listed above. Open to junior and senior majors or others by permission of instructor. 2 lectures, 1 laboratory, 2 credits.

### 582. PERSONAL AND COMMUNITY HEALTH

Course deals with the individual aspects of healthful living and the problems of community health as they relate to disease prevention and control. Mr. Wear. Prerequisite: Biology 401-402. 2 credits.

### 652. KINESIOLOGY; ADAPTIVE PHYSICAL EDUCATION

A course in body mechanics and kinesiology which deals with a program for the handicapped and individual problems in health and physical education. Mr. Kertzer. Prerequisite: Zoology 507. 3 credits.

### 655. REMEDIAL GYMNASTICS

The adaption of exercise to individual needs, capacities, and limitations; causes and treatment of physical abnormalities. Theory and techniques of massage. Mrs. Wooster. Prerequisite: Zoology 601 or concurrently. 2 lectures, 2 laboratories, 3 credits.

### 656. PROBLEMS OF HEALTH EDUCATION

Methods, materials, and principles of teaching school health. First aid, safety education, health examination, and recognition and prevention of disease. Mrs. Wooster. Open to physical education majors and others by permission of instructor. Prerequisite: Physical Education 582. 3 credits.

### 665. ADMINISTRATION OF PHYSICAL EDUCATION IN SECONDARY SCHOOLS

Administrative methods in the conduct of physical education, health education, and recreation. The planning of programs and policies in the light of past and present philosophies and in regard to current programs, facilities, equipment, selection of staff, and public relations. Miss Beckwith. 3 credits.

### 668. MEASUREMENT PROCEDURES IN PHYSICAL EDUCATION

Procedures used in the evaluation, construction, administration, and interpretation of measurement techniques used in physical education. Essential, elementary statistical methods are covered so that measurement data may be scientifically evaluated for application to the program. Miss Knowlton and Mr. Weiland. 3 credits.

### 788. RECREATION FIELD WORK

Opportunity for participation in the planning and operation of a variety

of recreation programs, under supervision, in nearby agencies and community centers. Prerequisite: Physical Education-Education 792 or concurrently. Miss Farrell. 1 lecture, 2-5 hour laboratories, 6 credits.

**EDUCATION-PHYSICAL EDUCATION (790), 790. DIRECTED TEACHING OF PHYSICAL EDUCATION**

Opportunity for teaching physical education activities under supervision primarily in the elementary and secondary schools. Miss Newman. Prerequisite: Physical Education-Education 792 or concurrently. 1 lecture, 2-5 hour laboratories, 6 credits.

**PHYSICAL EDUCATION-EDUCATION 792. PROBLEMS OF TEACHING PHYSICAL EDUCATION IN THE ELEMENTARY SCHOOL**

The methods, materials, and organization of a comprehensive program of activities for use primarily in the elementary school and in recreation programs. Miss Newman. Prerequisite: elementary games or its equivalent. 3 credits.

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## Physical Science (44)

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**401-402. THE EVOLUTION OF PHYSICAL SCIENCE**

The principles and methods of physical science illustrated by the development of major scientific ideas in the physical world. The course is directed toward an understanding of the intellectual achievement and problems of science as part of culture. Mr. Schnee. 3 lectures, 1 laboratory, 4 credits. *No credit toward a major.*

**(789). SEMINAR IN THE HISTORY OF SCIENCE**

Selected topics in the history of science, conducted through the use of special lectures, individual study, oral and written reports. The subject of the seminar will vary from year to year. *This course is the same as History 789.* Mr. Schnee. Prerequisite: permission of instructor. 3 credits. (Course usually offered in the second semester.)

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## Physics (86)

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Robert E. Houston, Jr., *Professor and Chairman*; David G. Clark, *Associate Professor and Associate Chairman*; Harry H. Hall, *Professor*; John A. Lockwood, *Professor*; Lyman Mower, *Professor*; Laurence J. Cahill, Jr., *Professor*; John E. Mulhern, Jr., *Professor*; Edward L. Chupp, *Professor*; Horace L. Howes, *Professor Emeritus*; Robert H. Lambert, *Associate Professor*; Richard L. Kaufmann, *Associate Professor*; George H. Mullen,

# Physics

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*Assistant Professor*; Robert E. Simpson, *Assistant Professor*; John Dowling, Jr., *Assistant Professor*; Mark P. Klein, *Assistant Professor*; Roger L. Arnoldy, *Assistant Professor*; L. Christian Balling, *Assistant Professor*; Robert W. Jenkins, *Instructor* (part-time); Antal A. Sarkady, *Instructor* (part-time)

## 401-402. INTRODUCTORY PHYSICS

A broad survey of both classical and modern physics, designed to enable the student to appreciate the role of physics in our society. The main emphasis is on the fundamental laws of nature upon which all science is based. This includes such topics as the conservation laws, structure of matter, relativity, atomic and nuclear phenomena, and elementary particles. (A student who decides to major in physics in the College of Liberal Arts may substitute this course for Physics 404 with the permission of the department.) 2 lectures, 1 recitation, 1 laboratory, 4 credits.

## 403. ELEMENTARY PHYSICS

An elementary course with emphasis on selected topics from the various fields of physics. A knowledge of high school algebra and plane geometry is a prerequisite. Open only to students in the College of Agriculture. 1 lecture, 2 recitations, 1 laboratory, 4 credits.

## 404. GENERAL PHYSICS I

An elementary course emphasizing the role of mechanics as a foundation underlying all of physics. This is the first semester of the three semester sequence: Physics 404, 501-502. Prerequisite: Mathematics 421 or 425 passed or taken concurrently. Should be taken as the introductory course for physics majors in the College of Liberal Arts\*; cannot be counted for major credit. 2 lectures, 2 recitations (in alternate weeks one of the recitations is a laboratory exercise); 4 credits.

## 405. CONCEPTS OF PHYSICS

A descriptive course investigating a limited number of important physical systems. Emphasis will be placed on how the system is to be investigated and the patterns in which the results fall. The intuitive concepts used in the investigations will be traced into their application in modern physics. Every effort will be made to relate the patterns of thought in physics to patterns of thought in Liberal Arts. Recommended for Liberal Arts juniors and seniors. 3 credits.

## 406. INTRODUCTORY ASTRONOMY

A brief descriptive course covering celestial coordinate systems and contemporary astronomical and astrophysical techniques with a review of current knowledge and theories concerning the solar system, galaxies, and the Universe. Recommended for Liberal Arts and beginning science students. 3 credits.

\* See description of Liberal Arts physics major program, page 112.

**501-502. GENERAL PHYSICS II, III**

Selected topics from electrostatics, electromagnetism, wave motion, kinetic theory, relativity, and quantum theory. Prerequisite: Physics 404 or Physics 401-402, Mathematics 422 or 426. Must be taken as the introductory course for physics majors in the College of Liberal Arts; cannot be counted for major credit. 2 lectures, 1 recitation, 1 laboratory, 4 credits.

**503. MODERN PHYSICS**

An introduction to twentieth century physics, including the structure of atoms and nuclei, including the basic ideas of quantum mechanics and solid state theory. Prerequisite: Physics 501, 502, Mathematics 523, 527. 3 credits.

**601-602. PHYSICAL MECHANICS**

An analytical treatment of classical mechanics covering the methods of statics and dynamics of particles and rigid bodies, both in a plane and in space, and the application of these methods to physical problems; oscillations; constrained motion; generalized co-ordinates and Lagrange's Equations. Prerequisite: Physics 501, 502, Mathematics 629-630 passed or taken concurrently. 3 lectures, 3 credits.

**605-606. EXPERIMENTAL PHYSICS I AND II**

Experiments in optics, heat, electricity and magnetism, and atomic physics. Prerequisite: Physics 601-602, 703, taken concurrently. Physics 605: 2 laboratories, 1 lecture, 3 credits. Physics 606: 2 laboratories, 3 credits.

**607. PHYSICAL OPTICS**

The electromagnetic theory of light, interference, diffraction, polarization, and related phenomena. Prerequisite: Physics 703 passed or taken concurrently. Mathematics 527. 3 credits.

**608. THERMODYNAMICS**

An introduction to thermodynamics and kinetic theory. 3 credits.

**609-610. EXPERIMENTAL PHYSICS III-IV**

Work of research type. Special problems are assigned to the individual student. Prerequisite: senior standing in physics. 2 laboratories, 3 credits.

**611-612. PHYSICAL COLLOQUIUM**

Participation in departmental colloquium reading, and study. Prerequisite: senior standing in physics. 1 credit. May be taken more than once. NLG.

**613-614. SPECIAL TOPICS**

Any selected topics not sufficiently well covered in a general course. Prerequisite: Mathematics 629-630 passed or taken concurrently, and senior standing in physics. 1, 2, or 3 cr.

## Physics

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### 618. INTRODUCTION TO SOLID STATE PHYSICS

A brief summary of the theory underlying the behavior of solids will be given. Emphasis will be placed on transport theory and the interaction of radiation and matter. The operation of semiconducting and superconducting devices and lasers will be considered. Prerequisite: Mathematics 527, Physics 502. 3 credits.

### 696. INDEPENDENT STUDY

Individual study projects in physics under the direction of a faculty adviser. Open only to physics honors students. 1-15 credits.

### 701. INTRODUCTORY QUANTUM MECHANICS

An introduction to quantum mechanics, with applications to atomic and molecular spectra. Prerequisite: Physics 703 and Mathematics 629-630 passed or taken concurrently. 3 credits.

### 702. ATOMIC AND NUCLEAR PHYSICS

Natural radioactivity, nuclear reactions, nuclear scattering, models of the nucleus, high energy nuclear physics, cosmic rays. Prerequisite: Physics 701. 3 credits.

### 703-704. ELECTRICITY AND MAGNETISM

Foundation of electromagnetic theory, including electrostatics, dielectric theory, electromagnetism, magnetic properties of matter, alternating currents, Maxwell's field theory, and an introduction to electrodynamics. Prerequisite: Physics 501-502; Mathematics 629-630 passed or taken concurrently. 3 credits.

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## Plant Science (32)

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Lincoln C. Peirce, *Professor and Chairman*; Ford S. Prince, *Professor Emeritus*; Gerald M. Dunn, *Professor*; Russell Eggert, *Professor*; Clarence A. Langer, *Professor*; Paul T. Blood, *Associate Professor*; Leroy J. Higgins, *Associate Professor*; Lorne A. McFadden, *Associate Professor*; Douglas G. Routley, *Associate Professor*; Owen M. Rogers, *Associate Professor*; James R. Mitchell, *Assistant Professor*; Otho S. Wells, *Assistant Professor*; Radcliffe B. Pike, *Extension Specialist*

### 401. PLANTS AND MAN

A study of basic plant sciences with emphasis on significant food and ornamental plants and their response to environment and culture. Staff. 3 credits.

### 402. CROPS FOR FEED AND FIBER

The distribution, growth, and management of crops for livestock and industry. Mr. Higgins. 2 lectures, 1 laboratory, 3 credits.

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403. THE WORLD OF PLANTS

The distribution of economically important plants, and man's efforts to control the growth of these plants for production of food and utilization of beauty. Mr. Peirce. 2 credits.

406. PLANT PROPAGATION

Controlled reproduction of plants with a discussion of microclimate and subsequent plant development. Mr. Rogers. Prerequisite: Botany 411. 2 lectures, 2 laboratories, 4 credits. (Not offered in 1967-68.)

427. LANDSCAPING THE HOME GROUNDS

The design and maintenance of small properties with emphasis on the principles of arrangement and the use and identification of plant materials in the beautification of home surroundings. Mr. Rogers. 2 lectures, 1 laboratory, 3 credits. (Not offered in 1967-68.)

603. SEED TESTING

The identification of seeds and the techniques used in official methods of sampling and analyzing agricultural seeds for purity and germination. Mrs. Sanborn, Seed Analyst. Prerequisite: Botany 411 and permission of instructor. 1 laboratory, 1 credit.

667. TURFGRASS MANAGEMENT

Characteristics of growth of fine turfgrasses, their adaptation to use, and their response to competition and environment. Mr. Higgins. 2 lectures, 1 laboratory (optional), 2-3 credits. (Alternate years; not offered in 1967-68.)

678. HERBACEOUS AND WOODY ORNAMENTALS

A survey of the more important ornamental plants, their growth characteristics, culture, maintenance, and use. Mr. Rogers. Prerequisite: Botany 411, 506. 3 lectures, 1 laboratory, 4 credits. (Alternate years; not offered in 1967-68.)

697-698. SENIOR SEMINAR

Required of all plant science seniors and open to seniors of related departments. Discussions in production and technological aspects of plant science. Staff. 1 credit each semester.

704. ANNUAL CROPS

A study of annual grains, silage crops, and potatoes and their characteristics of growth as affected by culture and management. Mr. Higgins. 2 lectures, 1 laboratory, 3 credits. (Alternate years; offered in 1967-68.)

706. PASTURE-HAY CROPS

A survey of the important forage and pasture crops, their characteristics of growth, culture, and management. Mr. Higgins. Prerequisite: Botany 411, Plant Science 402. 3 lectures, 1 laboratory, 4 credits. (Alternate years; not offered in 1967-68.)



## Plant Science

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### 708. NUTRITION AND WATER RELATIONS

Mineral requirements of plants and response to deficiencies. Effect of soil and atmospheric environments on plant growth and differentiation of plant parts. Mr. Eggert. Prerequisite: 3 credits in plant physiology. 2 lectures, 1 laboratory, 3 credits.

### 753. FRUIT CROPS

The growth and management of tree and small fruit crops. Pest control, storage, marketing, and response to pruning and grafting. Mr. Eggert. Prerequisite: 7 credits. Botany, Plant Science 406, 7 credits. Soils, 3 lectures, 1 laboratory, 4 credits. (Alternate years; not offered in 1967-68.)

### 764. VEGETABLE CROPS

Systematic classification of vegetable crops, their use, management, and response to environment and competition in food and seed production. Mr. Peirce. Prerequisite: Botany 411, Plant Science 406 or equivalent. 3 lectures, field trip, 3 credits. (Alternate years; not offered in 1967-68.)

### 765. SYSTEMATIC POMOLOGY

Taxonomic relationships and group characteristics among varieties of trees and small fruits. Mr. Eggert. Prerequisite: 6-8 credits in Botany. 1 lecture, 1 laboratory, 2 credits. (Alternate years; offered in 1967-68.)

### 768. PLANT GROWTH AND DEVELOPMENT

Biochemical and physiological aspects of crop production. Bases for changes in growth or development of plants effected by environment or treatments. Mr. Eggert. Prerequisite: Chemistry 545, Botany 756 or equivalent. 3 credits. (Alternate years; offered in 1967-68.)

### 774. METHODS AND THEORY OF PLANT BREEDING

History, theory and use of plant breeding systems, including bulk and pedigree methods, recurrent selection, gamete selection, and testing. Mr. Peirce. Prerequisite: 3 credits in genetics. 3 credits. (Alternate years; offered in 1967-68.)

### 795-796. INVESTIGATIONS IN PLANT SCIENCE

1. Plant Growth and Development: Mr. Eggert, Mr. Routley.
  2. Breeding and Genetics: Mr. Dunn, Mr. Peirce, Mr. Rogers.
  3. Crop Production and Management: Mr. Higgins, Mr. Eggert, Mr. Peirce.
  4. Ornamentals and Turfgrass: Mr. Higgins, Mr. Rogers.
- Selected topics for crop or library research. Prerequisite: permission of instructor. 1-4 credits.

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## Political Science (52)

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Robert B. Dishman, *Professor and Chairman*; John T. Holden, *Professor*; Erwin A. Jaffe, *Associate Professor*; George K. Romoser, *Associate Professor*; Frederic W. Wurzburg, *Associate Professor*; David L. Larson, *Associate Professor*; John H. Woodruff, *Associate Professor*; Joseph P. Ford, *Instructor*; Robert E. Craig, *Instructor*; Lawrence W. O'Connell, *Instructor*; Raymond E. Matheson, *Instructor*

*All students majoring in political science must complete political science 405 and 406 with a grade of C or better. These two courses qualify the student for his major but may not be counted for major credit.*

### 405. ELEMENTS OF POLITICAL SCIENCE

An introduction to politics and government in modern society. The scope and method of political science, the behavior of the individual and group in political society, the nature and structure of political power, and competing political ideologies, e.g., communism, elitism, democracy. Staff. Open to all students. 3 credits.

### 406. PRINCIPLES OF AMERICAN GOVERNMENT

The origins and development of the national government in the United States. The role which legislators, administrators, judges, and the people themselves play in the governmental process and the constitutional and political framework within which they operate. Staff. Open to all students. 3 credits.

### 408, (408). AMERICAN IN WORLD AFFAIRS

The problems of American foreign relations. The formulation and execution of policy, the emergence of the United States as a world power, contemporary issues confronting the country, and policies adopted to meet the issues. Mr. Holden. Open to all students. 3 credits.

### 513. INTRODUCTION TO STATE AND LOCAL GOVERNMENT

An examination of the institutions, services, historical background, and social, economic, and political environment of state and local governments. Emphasis will be placed upon the political process and the relation between structure and politics, including an analysis of the impact of this relationship upon executive, legislative, and judicial powers. State-local relations will be examined in some detail. Mr. Ford. 3 credits.

### 514. PROBLEMS IN STATE AND LOCAL GOVERNMENT

An examination of selected problems in state and local government and their proposed solutions. Topics to be covered include the role of states in a federal system, metropolitanism, urban planning, reapportionment of state legislatures, taxation and educational politics. Field trips to town meetings and to the state legislature, when in session, will be included. Mr. Ford. Prerequisite: Political Science 513. 3 credits.

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### 515. WESTERN EUROPEAN DEMOCRACY

A comparative study of the leading democratic systems in Western Europe, including Great Britain, France, and the German Federal Republic. Mr. Wurzburg and Mr. Woodruff. Prerequisite: Political Science 405 or permission of instructor. 3 credits.

### 516. TOTALITARIAN DICTATORSHIP

A comparative study of totalitarian dictatorship emphasizing the Communist regimes of Russia and China but with some attention given to Fascist regimes. Mr. Wurzburg. Prerequisite: Political Science 405 or permission of instructor. 3 credits.

### 525. AMERICAN PARTY SYSTEM AND VOTING BEHAVIOR

The functions of political parties in the American political system. Party organization and operation during and between elections. The bases of electoral support for the parties and the sources of party personnel, including candidates. The operation and role of parties in campaigns and elections and voting behavior in the several types of elections. The role of political parties in the democratic political system. Mr. Craig. 3 credits.

### 535. THE THEORY OF INTERNATIONAL RELATIONS

The integrated and interdisciplinary study of the behavior of nation-states in relation to one another. The growth and development of the nation-state system with its correlative aspects of sovereignty, international law, nationalism, internationalism, and international organization. Prerequisite: Political Science 405, 408 or permission of instructor. Mr. Larson. 3 credits.

### 536. THE PRACTICE OF INTERNATIONAL RELATIONS

The struggle for power, prestige and prosperity between and among nation-states. An analysis of the national interest-ideological axis will be made with some attention paid to the causal factors of the phenomena of international affairs. Prerequisite: Political Science 535 or permission of instructor. Mr. Larson. 3 credits.

### 561. AMERICAN POLITICAL THOUGHT

A survey and analysis of the major theories which have contributed to American political thinking from the colonial period to the present. Prerequisite: Political Science 405, 406 or introductory American history course. Mr. Jaffe. 3 credits.

### 715. COMPARATIVE POLITICS

Concepts of government and politics dealing with political dynamics, institutions, and change in developed and under-developed areas by use of the comparative method. Mr. Wurzburg. 3 credits.

### 717. CONTINENTAL EUROPEAN POLITICAL PARTIES

The relationship of theories of representation and political parties to

historical circumstance. Following an appraisal of today's party systems, chronological treatment serves to show how changes within and among political parties are connected with the changing role parties play in the political process. Prerequisite: permission of department. Mr. Wurzburg. 3 credits.

### 726. PRESSURE GROUPS AND THE GOVERNMENTAL PROCESS

Political interests groups as an unofficial "third house" of American national and state legislatures. The efforts by pressure groups to influence public officials by lobbying, propaganda, and direct political action. Mr. Ford. Prerequisite: Political Science 406. 3 credits.

### 727. THE AMERICAN POLITICAL EXECUTIVE

The behavior of the American President and other political executives in the formulation and execution of policy. The relation of political executives to the legislature, the courts, and the bureaucracy. Public opinion, groups, and voting behavior and the problem of executive political leadership and power. The role of the political executive in democratic political systems in modern times and the prospects for the future. Mr. Craig. (Not offered in 1967-68.) 3 credits.

### 728. LEGISLATURE BEHAVIOR AND THE UNITED STATES CONGRESS

The role of Congress and legislative behavior in the American political system. The organization, operation and process of legislating. The personnel and informal rules of the legislative process. The influence of groups, public opinion, elections and decision-making agencies on the legislative policy-making process. The analysis of proposed reforms of legislatures. The functions of legislative policy-making in democratic political systems. Mr. Craig. 3 credits.

### 731. THE ADMINISTRATIVE PROCESS

The principal concepts of governmental administration, including theories of organization, administrative leadership, internal management, and administrative responsibility and control. The relationship of group behavior and policy development to the administrative process. Prerequisite: Political Science 406 or Sociology 400. 3 credits.

### 736. URBAN GOVERNMENT AND POLITICS

The role of government in the planning and managing of the urban community, as well as the political problems of the metropolitan complex will be considered. Metropolitan planning will be treated in relation to zoning, land use, open space preservation, and transportation. The administrative functions to be studied include welfare, health, urban renewal, and police protection. Mr. O'Connell. 3 credits.

### 741. ADMINISTRATION OF JUSTICE

A comparative study from primitive times to the present of the administration of criminal and civil justice under various legal institutions and

systems. The modern role of the police, public prosecutor, judge, jury, counsel, and interest groups in the judicial process in the United States and in other nations, including England and Wales, France, Germany, and the Soviet Union. Mr. Dishman. 3 credits.

### 742. THE SUPREME COURT AND THE AMERICAN CONSTITUTION

The Supreme Court considered as both a court of law and a political institution. The origins and development of judicial review and changing conceptions of the judicial process. The Supreme Court as supreme arbitrator in disputes between the nation and the states, the President and Congress, and majority rule and minority rights. Mr. Dishman. Prerequisite: Political Science 406 or permission of instructor. 3 credits.

### 745. WORLD POLITICS

The basic driving forces in international relations, including the nature of political power and its extension or limitation. Geopolitics, nationalism, ideology, imperialism, international economic relations, balance of power, warfare, regulation of arms, international law, and collective security. Mr. Holden. 3 credits.

### 746. FOREIGN POLICIES OF THE GREAT POWERS

Fundamental factors influencing contemporary foreign policy formulation of the United States, the Soviet Union, the Commonwealth, and other significant powers. Problems and choices confronting policy makers of these powers in dealing with issues involving the United Nations, regional organizations, Western Europe, the Middle East, and Asia. Mr. Holden. 3 credits.

### 747. CONDUCT OF FOREIGN POLICY

The constitutional, institutional, and procedural aspects of decision-making within the framework of U. S. national security and national policy. Some emphasis will be given to the ideological framework within which the decision-making process occurs. Mr. Larson. 3 credits.

### 751. CONTEMPORARY SOUTHEAST ASIA

A comparative study of the political and social development of South East Asia. The significance of the role of independence and dependence; the competing influence of communism and Western democracy; the special significance of the role of China, India, Great Britain, and the United States. The states to be studied include the Philippines, Laos, Cambodia, Viet Nam, Thailand, Burma, Malaysia and Indonesia. Mr. Holden. 3 credits.

### 752. GOVERNMENT OF EMERGING COUNTRIES

A comparative study of recent developments in the politics and governing systems of Asia and Africa, and regional arrangements indigenous to these areas. Prerequisite: Political Science 405 or permission of instructor. 3 credits.



754. GOVERNMENTS OF LATIN AMERICA

A comparative study of the politics and governing systems of Latin America with some consideration given to regional arrangements. Mr. Larson. Prerequisite: Political Science 405 or permission of instructor. 3 credits.

756. CONTEMPORARY SOUTH ASIA

A comparative and analytical study of the historic, political, social, and economic influences in modern South Asia. Special attention will be paid to the rivalries between Pakistan and India, to the pressures of the Soviet, the United States and China; to the influences of both the Commonwealth and the Afro-Asian bloc ideals and goals. The states to be included are Pakistan, India, Ceylon, and Afghanistan. Mr. Holden. 3 credits. (Not offered in 1967-68.)

757. GOVERNMENT AND POLITICS OF CHINA

A brief but intensive historical background is followed by an analysis of recent developments in the field of government, parties, and ideologies of China. Course concludes with a survey of recent developments in international relations and foreign policy relevant to the country considered. Mr. Woodruff. 3 credits.

758. GOVERNMENT AND POLITICS OF JAPAN

A brief but intensive historical background is followed by an analysis of recent developments in the field of government, parties, and ideologies of Japan. Course concludes with a survey of recent developments in international relations and foreign policy relevant to the country considered. Mr. Woodruff. 3 credits.

763. POLITICAL THEORY I

A critical, analytical and contextual survey of Greek, Roman, medieval and Renaissance political theory. In depth treatment of major philosophers — Plato, Aristotle, St. Augustine, St. Thomas Aquinas, Machiavelli — will be undertaken, as time permits. Mr. Romoser. 3 credits.

764. POLITICAL THEORY II

A critical, analytical and contextual survey of representative modern political theorists. In depth treatment of philosophers whose contributions to political thought have been primary — Hobbes, Locke, Rousseau, Hegel, Marx — will be undertaken as time permits. Mr. Jaffe. 3 credits.

765. CONTEMPORARY POLITICAL THEORY

A survey and analysis of contemporary political theories. The crisis in democratic thought, totalitarian ideology, the search for scientific political theory. Prerequisite: Political Science 763, 764, or permission of instructor. Mr. Romoser. 3 credits.



## Political Science

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### 771. RESEARCH IN POLITICAL BEHAVIOR

An introduction to the methodology and techniques of research in political behavior, broadly defined. Emphasis will change from time to time to include various types of empirical research and their optimal use. Such approaches as surveys, experimental designs, and basic data processing techniques will be combined with library and documentary research to produce a significant research paper by each student. Mr. Craig. 3 credits.

### 775. INTERNATIONAL LAW

The theory and practice of international law and its relation to the international community of nation-states and international organizations. Also, the function of law in international relations as analyzed from decisions of national and international tribunals and as manifested in constitutions, charters, and other international documents. Prerequisite: permission of instructor. Mr. Woodruff. 3 credits. (Not offered in 1967-68.)

### 776. INTERNATIONAL ORGANIZATION

The theory of collective security and cooperation and the practice of international organizations as a response to meeting the needs of the international community. Emphasis will be placed upon the League-United Nations System and specialized regional organizations. Prerequisite: Political Science 765 or permission of instructor. Mr. Larson. 3 credits.

### 779. PUBLIC POLICY AND REGIONALISM

3 credits (Not offered in 1967-68.)

### 795, 796. SELECTED TOPICS IN POLITICAL SCIENCE

This course number will be used either for special courses that are not regularly offered or for independent study. Staff. 1-6 credits.

### 797, 798. SEMINAR IN POLITICAL SCIENCE

A selected current topic from government, political philosophy and history, political behavior, public law, public administration, or international relations will be the vehicle for this seminar. Each student is held responsible for a specific phase of the selected problem. He will also, through the techniques of the seminar, acquaint himself with the whole project. The course is restricted to undergraduates with honor grades and graduate students in social science. Advance copies of the syllabus may be secured from the Chairman of the Department. Permission of the instructor is required. Staff. 3 credits.

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## Psychology (67)

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Raymond L. Erickson, *Associate Professor and Chairman*; Herbert A. Carroll, *Professor Emeritus*; George M. Haslerud, *Professor*; Eugene S. Mills, *Professor*; Robert I. Watson, *Professor*; Frederick M. Jervis, *Associate Professor*; Earl C. Hagstrom, *Associate Professor*; Som N. Ghei, *Associate Professor*; Walter R. Duryea, *Assistant Professor*; Robert G. Congdon, *Assistant Professor*; Edward F. Rutledge, *Assistant Professor*; Gordon A. Haaland, *Assistant Professor*; Ralph F. Sibley, *Assistant Professor*; Thomas E. Dubois, *Assistant Professor*

### 401-402. GENERAL PSYCHOLOGY

Psychology as a behavioral science, with emphasis on both its theoretical and applied aspects. The basic determinants of behavior and the nature of psychological inquiry are considered. Included in the first semester are such topics as the history of psychology, scientific methods, perception, conditioning, verbal behavior and thinking, and the biological bases of behavior. In the second semester, motivation, frustration and conflict, psychopathology, psychological testing, personality, and social behavior. Completion of both semesters is a prerequisite for all other courses in the department, except with permission of the instructor. Cannot be counted for major credit. Not open to students who have taken Psychology 1. Staff. 3 credits.

### 537. DEVELOPMENTAL PSYCHOLOGY

Man's behavioral and psychological development and their relation to physical growth. Phylogentic and ontogenetic development are examined and pertinent animal studies are introduced. The prenatal period is considered along with childhood, adolescence, and early maturity. The developmental methods of study are also an integral part of the course. Mr. Duryea. Prerequisite: Psychology 402. 3 credits.

### 545. PSYCHODYNAMICS OF NORMAL AND ABNORMAL BEHAVIOR

An examination of the biological and social influences on the development of personality. The role of needs and values in personality development, and the relationship of biological and psychological tension systems are considered. Major emphasis is given to the continuity between normal and abnormal modes of coping with stress. Mr. Sibley. Prerequisite: Psychology 402. 3 credits.

### 567. STATISTICS IN PSYCHOLOGY

Investigation of the methods utilized in the statistical analysis of psychological data and an introduction to experimental methodology. The basic concepts of descriptive statistics and the principles of statistical inference are examined. The student gains experience in the appropriate use of tests of significance on data that he collects. Prerequisite: Psy-

chology 402. 2 lectures, 1 laboratory, 3 credits. *Required of all undergraduate majors in psychology.*

### 568. EXPERIMENTAL PSYCHOLOGY

The application of experimental methods to a variety of psychological phenomena. Principles of experimental design and methods of data analysis are given emphasis. In addition to participating in and writing up a sequence of basic laboratory experiments, each student will be responsible for conceiving, conducting, and reporting an original experiment. Mr. Rutledge. Prerequisite: Psychology 567. 2 lectures, 2 laboratories, 4 credits.

### 605. MENTAL HYGIENE IN TEACHING

The fundamental needs of human beings, with emphasis on the mental and emotional conflicts of secondary school students arising from frustration of these needs. Ways of recognizing these conflicts and of helping students to resolve them are considered in detail. Attention also is given to sources of stress in the teaching profession. Mr. Carroll. Prerequisite: Psychology 402. (Offered only in the summer.) 3 credits.

### 663. THE EXCEPTIONAL CHILD

A comparison of gifted, retarded, physically handicapped, and emotionally disturbed children along such basic psychological dimensions as intellectual functioning, personality dynamics, and adjustment problems. Mr. Duryea. Prerequisite: Psychology 402. 3 credits.

### 695. HONORS IN PSYCHOLOGY

Open to seniors with a 3.0 average in psychology courses and the recommendation of a member of the Psychology faculty, or in unusual cases to those who receive special departmental permission. As individuals, or as members of a seminar group, students make library and/or laboratory investigations of problems of mutual interest to professor and student. Oral or written reports made by members of the seminar are a basis for discussion. Staff. Prerequisite: 15 semester credits in psychology. 3 credits.

### 744. THEORIES OF PERSONALITY

The major theories of personality, with an examination of clinical and research literature as it is related to the nature and development of personality. Mr. Jervis. Prerequisite: Psychology 402. 3 credits.

### 754. ABNORMAL PSYCHOLOGY

A systematic examination of abnormal behavior patterns. The neuroses, psychoses, and character disorders are considered in detail, in terms of their etiology, symptoms and dynamics, and treatment. Mr. Sibley. Prerequisite: Psychology 402. 3 credits.

### 758. PSYCHOLOGY OF LEARNING

An evaluation of contemporary theories of learning. Attention is given

to the historical antecedents of current theories, their experimental support, and practical implications. Mr. Haslerud. Prerequisite: Psychology 402. 3 credits.

760. PSYCHOLOGY OF MOTIVATION

Motivational constructs are studied in relation to contemporary theories of behavior. The role of motivational variables is considered in relation to such other areas of psychology as learning, perception, and personality. Mr. Rutledge. Prerequisite: Psychology 402. 3 credits.

776. COMPARATIVE PSYCHOLOGY

Appraisal of the similarities and differences in the behavior of infra-human organisms as an aid to understanding the evolution of complex behavior. The comparative method is applied to the study of such topics as instinct, consciousness, reasoning, judgment, social influence, and abnormal behavior. Mr. Hagstrom. Prerequisite: Psychology 402. 3 credits.

778. PHYSIOLOGICAL PSYCHOLOGY

A study of behavior as it is related to the physiological structure and function of the organism. Special attention is given to sensory, neural, and glandular functions as organic bases for factors such as motivation, emotion, and learning. Mr. Hagstrom. Prerequisite: Psychology 402. 3 credits.

780. SOCIAL PSYCHOLOGY

A consideration of the social factors affecting perceptual-cognitive processes, learning, motivation, and the behavior of man in the social system. Mr. Haaland. Prerequisite: Psychology 402. 3 credits.

783. SYSTEMATIC PSYCHOLOGY

An evaluation of the numerous approaches to the study of behavior that exist within contemporary psychology. Historical perspective is given by attention to the major antecedents in philosophy, theology, and the physical sciences, and their relationship to the subsequent development of schools and systems of psychology. Mr. Watson. Prerequisite: Psychology 402. 3 credits.

789, (789). SPECIAL TOPICS IN PSYCHOLOGY

Taught by a different staff member each year. The instructor will present advanced material in an area in which he has developed specialized knowledge through research and special study. Students may repeat the course, but may not duplicate areas of specialization. Staff. Prerequisite: 15 credits in psychology and/or permission of instructor. 3 credits.

797. THE INTEGRATING OF PSYCHOLOGY

Through lectures, discussions, and papers, senior majors recall and reassess their knowledge of psychology, fill gaps in their background, and work on the growing edge of the science. The examination in this course

satisfies the departmental requirement of a comprehensive examination. Mr. Haslerud. Prerequisite: 12 semester credits in psychology. 3 credits. *Required of all undergraduate majors in psychology.*

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## Reserve Officers Training Corps

### Department of Military Science (98)

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Colonel Pierre D. Boy, *Professor of Military Science*; Lieutenant Colonel Wayne C. Smith, Jr., Infantry, *Assistant Professor*; Major Mason E. Martin, Infantry, *Assistant Professor*; Captain Anthony D. Potter, Artillery, *Assistant Professor*; Captain Dister L. Deoss, Artillery, *Assistant Professor*; Master Sergeant Joseph E. R. Guertin, *Assistant*; *Sergeant* Alton F. Lindsay, *Assistant*; *Sergeant* Robert M. Perrin, *Assistant*; Master Sergeant Clarence P. Andersen, U. S. Army (Retired), *Army ROTC Property Officer*

The Army Reserve Officer Training Corps offers a course of instruction leading to a commission as second lieutenant in one of fourteen branches of the United States Army. Successful completion of the course and the award of a baccalaureate degree by the University qualify the graduate for this commission.

The Military Science courses follow the student's normal academic progression, i.e., a student takes Military Science 413-414 during his freshman year and Military Science 523-524 during his sophomore year. If he elects and is accepted for Advanced ROTC, he will take Military Science 633-634 and Military Science 743-744 during his junior and senior years respectively.

To qualify for the advanced course and its military allowance, applicants are required to have earned a minimum overall cumulative grade average of 2.0, to have demonstrated positive leadership potential in the basic course, to be physically qualified, to be selected by the Professor of Military Science, and to be approved for admission to the program by the President of the University.

A two-year intensified program leading to a commission in the U. S. Army also will be offered. For details, contact the Professor of Military Science.

#### 413. FUNDAMENTALS OF MILITARY SCIENCE

The organization of the Army and ROTC and the Army and national security. Practical training in leadership, marksmanship, military drill, and command provides a balanced picture of the mission of the Army and an introduction to the military program. Two hours of classroom instruction plus leadership laboratory. 2 credits.

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### 414. CONCURRENT DEVELOPMENT

An integrated course consisting of leadership laboratory conducted by the Army ROTC Department and an elective University subject which, in the opinion of the student's faculty adviser and the Professor of Military Science, will develop the cadet's potential. The elective course must be selected from the areas of effective communication, science comprehension, general psychology, or political development and political institutions. A course falling within one of these areas, which is also required in the student's college curriculum, is acceptable. Credit is awarded after satisfactory completion of the elective course and leadership laboratory. Credit. NLG.

### 523. AMERICAN MILITARY HISTORY

A survey of American military history from the origins of the American Army to the present with emphasis on the factors which led to the organizational, tactical, logistical, operational, strategic, social and similar patterns found in our present-day Army and society. Practical application of leadership, drill, and command. Two hours of classroom instruction plus leadership laboratory. 2 credits.

### 524. LAND NAVIGATION AND THE PRINCIPLES OF MILITARY OPERATIONS

The science of military maps and land navigation. An introduction to military operations with emphasis on the principles of firepower and maneuver. Practical application of leadership, drill, and command. Two hours of classroom instruction plus leadership laboratory. 2 credits.

### 633. PROFESSIONAL DEVELOPMENT

Military instruction for two hours each week plus a three-credit academic subject which, in the opinion of the student's faculty adviser and the Professor of Military Science, will contribute to the cadet's potential as a prospective Army officer. The academic subject must be selected from the areas of effective communication, science comprehension, general psychology, or political developments and political institutions. Military instruction, a prerequisite for cadet subsistence pay and commissioning, will include leadership laboratory and branches of the Army. The integrated course of instruction outlined above must provide for a minimum of five hours of instruction per week. Credit is awarded upon satisfactory completion of the elective course and leadership laboratory. Cr. NLG.

### 634. MILITARY LEADERSHIP AND COMMAND

The principles of leadership. The theory and practice of military teaching methods. Small unit tactics. Military communication facilities. Leadership laboratory to include exercise of command of small units. Five hours of instruction per week. 3 credits.

### 743. PRINCIPLES OF COMMAND AND STAFF

An introduction to the military staff and military staff work to include



## Military Science

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the relationship between command and staff, relationship of staff to subordinate units, command channels, liaison, military intelligence, and training management. Military logistics to include troop movements, motor transportation, and supply and evacuation. Army administration and military law. Leadership laboratory to include practical application of leadership principles and exercise of command. Minimum of five hours of instruction per week. 3 credits.

### 744. PROFESSIONAL DEVELOPMENT

Military instruction for two hours each week plus a three-credit academic subject which, in the opinion of the student's faculty adviser and the Professor of Military Science, will contribute to the cadet's potential as a prospective Army officer. The academic subject must be selected from the areas of effective communication, science comprehension, general psychology, or political developments and political institutions. Military instruction, a prerequisite for cadet subsistence allowance and commissioning, will include leadership laboratory, service orientation, and a study of the role of the United States in world affairs. The integrated course of instruction outlined above must provide for a minimum of five hours of instruction per week. Credit is awarded upon satisfactory completion of the elective course and leadership laboratory. Cr. NLG.

### 406. ARMY ROTC BAND

Open only to freshmen and sophomore men enrolled in the Army ROTC program on basis of individual tryouts. This band furnishes music for all Army ROTC military functions.  $\frac{1}{2}$  credit semester. NLG.

### ARMY FLIGHT TRAINING

A program conducted by licensed flight instructors which includes a thirty-five hour ground school and a thirty-six hour flying phase. Successful completion may lead to a private pilot's license and a career in Army aviation. Open to Army ROTC senior advanced-course students who can meet physical and aptitude requirements. No credit.

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## Department of Aerospace Studies (99)

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Lieutenant Colonel Bud Barbee, USAF, *Professor*; Major Don L. Thompson, USAF, *Assistant Professor*; Major Denis J. Driscoll, USAF, *Assistant Professor*; Captain John F. Kenney, USAF, *Assistant Professor*; Master Sergeant Charles E. Mooers, USAF, *Assistant*; Master Sergeant Arthur R. Wordell, USAF, *Assistant*; A1C James H. Musgrove, USAF, *Assistant*

Air Force ROTC offers both a four-year and a two-year campus program. Both programs lead to an Air Force commission.

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The four-year Air Force ROTC curriculum has two divisions. The general military course (basic), or lower division, consists of Aerospace Studies 415, 416, 525, and 526. In these freshman and sophomore courses the student acquires training in leadership skills, gains a broader understanding of the vital issues at play in national and international affairs, and learns the roles of the military services in national security.

The professional officer course (advanced), or upper division, consists of Aerospace Studies 635, 636, 745 and 746. This course is open to both the four-year student as he enters the junior year and to those who enter the special two-year Air Force ROTC program. The course includes specialized instruction in the growth and development of aerospace power, astronautics and space operations, and management principles and practices.

Selection for the professional officer course is based upon character, attitude, academic record, and leadership ability. Each cadet selected must be a student in good standing with the University, must successfully complete a battery of Air Force officer qualifying tests, and be physically qualified for a commission. Two-year program students must have two years of undergraduate or graduate study remaining to be eligible to apply, and must successfully complete a six-week field training course prior to admission. Four-year students normally attend field training for four weeks in the summer between the junior and senior years.

Successful completion of the professional officer course and the award of a degree by the University qualify the student for a commission as an officer in the U. S. Air Force Reserve.

About one-third of those admitted into the professional officer course are physically qualified for, and desire, flight training as a pilot or navigator. Pilot cadets will receive, during their senior year, ground instruction and 36½ hours of flight instruction, under the supervision of the Federal Aviation Agency, as a prelude to to the Air Force flight schools.

Attractive financial aid is available to students entering both the four-year and the two-year programs. Students in the four-year program will be eligible to compete for merit scholarships which cover all costs of tuition, fees and books. In addition, all students accepted for entry into the professional officer course will receive a monthly retainer pay while pursuing courses of study leading to an Air Force commission. Special pay is authorized cadets when they attend summer training at an Air Force base.

### 415. WORLD MILITARY SYSTEMS I

The first of four sequential courses required of all students in the four-year AFROTC program. This introductory course explores aspects of national power, the development of the modern superpowers, and their impact upon the world. U. S. foreign policy goals, military policy and organization for national defense are analyzed. Leadership laboratory is

an introduction to military customs and courtesies and the practice of basic drill procedures. 1 lecture, 1 laboratory, 1 credit.

### 416. WORLD MILITARY SYSTEMS II

Following a brief introduction to the organization of the United States Air Force, the Strategic Offensive and Strategic Defensive forces of the United States are studied and examined. Leadership laboratory continues. 1 lecture, 1 laboratory, 1 credit.

### 525. WORLD MILITARY SYSTEMS III

The student continues to study the United States defense establishment through an analysis of the United States General Purpose forces, which include the U. S. Army and Navy. Also covered are the major support commands of the U. S. Air Force. Leadership laboratory emphasizes gaining leadership experience through actual command of small units. 1 lecture, 1 laboratory, 1 credit.

### 526. WORLD MILITARY SYSTEMS IV

In this final course of the basic AFROTC program, the students discuss and research the changing world alliances, both Western and Communist, and analyze the prospects for war or peace. Leadership laboratory continues. 1 lecture, 1 laboratory, 1 credit.

### 635. THE UNITED STATES AIR FORCE

The nature of military conflict and the development of aerospace power into a prime security element. The modes of employment of aerospace forces in general war, limited war, and actions short of war. Includes training in the development of leadership skills. 3 lectures, 1 laboratory, 3 credits.

### 636. UNITED STATES SPACE OPERATIONS

The development and the importance of the national space effort, the characteristics of the solar system that affect space exploration and operation, and current and planned capabilities for space operations. Includes training in the development of leadership skills. 3 lectures, 1 laboratory, 3 credits.

### 745. USAF PROFESSIONAL OFFICER DEVELOPMENT

The meaning of military professionalism, responsibilities of the professional man, and his relationship to the military services and national security. The military justice system and specific aspects of military life. Includes training and development of leadership skills. Flight instruction, training in weather and air navigation, and an opportunity to qualify for a private pilot's license is offered to selected cadets. 3 lectures, 1 laboratory, 3 credits.

### 746. USAF PROFESSIONAL OFFICER DEVELOPMENT

Leadership theory, functions, and practices; management principles and

functions; problem solving; and management tools, practices, and controls. Specific personal matters to help the cadet make a rapid, effective adjustment to active duty as an Air Force officer. For those selected, flight instruction continues in weather, air navigation, and preparation for a private pilot's license. 3 lectures, 1 laboratory, 3 credits.

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## Resource Economics (21)

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James R. Bowring, *Professor and Acting Chairman*; Harold C. Grinnell, *Professor Emeritus*; William H. Drew, *Professor*; William F. Henry, *Professor*; George E. Frick, *Adjunct Professor*; Richard A. Andrews, *Associate Professor*; Owen B. Durgin, *Associate Professor*; Silas B. Weeks, *Associate Professor*; Nelson L. LeRay, *Adjunct Associate Professor*; Nicolas Engalichev, *Assistant Professor*; Robert L. Christensen, *Assistant Professor*; Robert H. Forste, *Instructor*

### 402. ECONOMICS OF AGRICULTURE AND GROWTH

The roles of labor, capital, and technology in growth and development. The economics of agricultural production, food marketing, and consumer decision making. National policy for agricultural prices, land use, and resource development. Mr. Henry. 3 credits.

### 501. AGRICULTURAL BUSINESS

A study of structure, organization, and performance in the agricultural business sector. Major emphasis is placed on the decision-making process in management and on quantitative techniques used to aid in decision making. Demand estimation, cost analysis, pricing policies, plant location, and other related topics are integral in the course content. This material is related to the market and institutional environment within which the firm must function. Actual problems and case materials are used to develop the student's capabilities. Mr. Christensen. 3 credits.

### 504. MANAGEMENT OF FARM AND RELATED RESOURCE-BASED BUSINESS

Planning, operation, and management control in the economic and institutional environment. An understanding of decision-making principles, analyzing records, planning adjustments, and organizing the firm. Laboratory experience in organizing the business firm, budgeting changes, decision-making, estimating credit needs, and measuring growth. Emphasis is placed upon the proprietorship and the partnership forms of business organization. Prerequisite: Economics 402 or Resource Economics 402 or permission of instructor. Mr. Andrews. 2 lectures, 1 laboratory, 3 credits.

### 507. ECONOMICS OF CONSUMPTION

The significance to the economy of consumer decisions about spending

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## Resource Economics

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and saving. The economic theories of consumer decision making. Factors influencing consumer choice, such as product prices and grades, retail merchandising, and consumer incomes. Process of maximizing consumer satisfaction. Mr. Forste. 3 credits.

### 611. PUBLIC POLICY FOR AGRICULTURAL AND NATURAL RESOURCES

The development and implementation of policies for the use of agricultural and other natural resources. Production and marketing controls, land use and conservation measures, and the contribution that economic principles can make in determining desirable policies. Mr. Drew. 3 credits.

### 697-698. SEMINAR IN RESOURCE ECONOMICS

Presentation and discussion of reports on economic theory and current topics on resource development with departmental staff. Prerequisite: Junior standing. May be repeated. 1 credit.

### 706. ECONOMICS OF RESOURCE DEVELOPMENT

The classical and modern theories of economic development. Economic problems of land and resources in relation to market location, urban-rural conflicting demands, and conservation and water supply. Population mobility, capital needs, and the roles of public and private leadership will complete the framework for discussion of the major resource development problems of New England. Mr. Bowring. Prerequisite: Economics 1. 3 credits.

### 708. RESEARCH METHODS IN SOCIAL SCIENCES

The scientific method of research. The meaning of logic and the scientific method and on the application of research techniques to identifying and solving problems. Can be used in place of Sociology 702. Prerequisite: 3 hours of statistics. Mr. Drew. 3 credits.

### 715. LINEAR PROGRAMMING METHODS

Setting up and solving problems by the simplex and distribution methods; variation in linear programming methods with applications, non-linear programming, discrete programming, and solving input-output and game theory problems. Applications to firm and aggregate economic analysis. Prerequisite: Mathematics 407 or permission of instructor. Mr. Andrews. 3 credits.

### 795-796. INVESTIGATIONS IN RESOURCE ECONOMICS

Special assignments in readings and problems to satisfy students' needs. Mr. Andrews, Mr. Bowring, Mr. Christensen, Mr. Drew, Mr. Henry, and Mr. Weeks. 1-3 credits.



**Russian**(See German and Russian)

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**Secretarial (73)**

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Myra L. Davis, *Associate Professor*

**401-402. SHORTHAND**

Principles of Gregg shorthand with practice in transcribing from shorthand plates and class notes. Miss Davis. Prerequisite: proficiency in typing or Secretarial 407-408 which must be taken in conjunction with this course. 3 credits.

**405, (405). PERSONAL USE TYPEWRITING**

Practice in acquiring correct typing techniques, arranging letters, outlines, notes, themes, bibliographies, and simple tabulations. Open to any student who does not know how to typewrite. Miss Davis. 5 laboratories, 1 credit. NLG.

**407-408. TYPEWRITING**

Practice in acquiring correct typewriting techniques and in arranging letters, tabulations, and simple manuscripts. Miss Davis. Prerequisite: permission of instructor. 5 laboratories, 2 credits. (See Secretarial 427).

**427. TYPEWRITING**

Practice in acquiring correct typewriting techniques, and in arranging letters, tabulations, and simple manuscripts. This course, which begins on November 15, 1967, is to be taken instead of Secretarial 407 by Secretarial students who have had Secretarial 405 or the equivalent. Prerequisite: Secretarial 405 or equivalent and permission of instructor. Miss Davis. 5 laboratories, 1 credit.

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**Social Science (45)**

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These courses are given under the auspices of the Division of Social Science of the College of Liberal Arts.

**681, (681). INTERNSHIPS**

Field work in a department, agency, or institutional setting of the state or local government, or in a selected and approved private agency. The work will be under the supervision of the department or agency to which the student is appointed. The chairman of the department involved or his representative will be responsible for arranging the student's individual internship program. Prerequisite: Internships for seniors only may be approved by the departments of History, Political Science, Psychology, or Sociology or the Whittemore School of Business and

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## Social Science

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Economics. Not more than 16 credits. *No more than 9 credits may be counted toward the completion of major requirements.*

### 697, 698. SOCIAL SCIENCE COLLOQUIUM

A seminar devoted to the study of the social sciences. The unique aspects of political science, psychology, sociology, economics, and history are emphasized, as well as interdisciplinary implications, through extensive written work and discussions. Limited to Ford Foundation scholars. 3 credits. NLG.

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## Sociology (68)

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Stuart Palmer, *Professor and Chairman*; Charles W. Coulter, *Professor Emeritus*; Richard Dewey, *Professor*; Melville Nielson, *Associate Professor*; Melvin T. Bobick, *Associate Professor*; Solomon Poll, *Associate Professor*; Peter Dodge, *Associate Professor*; Owen B. Durgin, *Associate Professor of Resource Economics*; Richard E. Downs, *Associate Professor of Anthropology*; Pauline Soukaris, *Assistant Professor*; Richard Ingersoll, *Assistant Professor*; Frederick Samuels, *Assistant Professor*; Arnold S. Linsky, *Assistant Professor*; Forbes Bryce, *Lecturer*

### Anthropology Courses

#### 411, (411). CULTURAL ANTHROPOLOGY

The concepts and methods of anthropology. The structure of culture; culture and personality; economic, family, educational, political, and religious institutions; art; language. Data concerning various primitive societies are presented. 3 credits.

#### 512. INTRODUCTION TO WORLD ETHNOGRAPHY

Primarily for sociology majors and minors but also for those with a general interest in sociology or anthropology. Selected studies of peoples in the major ethnographic areas of the world. Particular attention will be paid to historical and geographic factors involved in these areas, types of social and economic organization, and problems involved in the comparative study of human societies and institutions. Prerequisite: Sociology 411 or permission of instructor. 3 credits.

#### 755. ETHNOGRAPHY OF SOUTHEAST ASIA

A study of the geographical, racial, cultural, and historical factors in the development of the area, together with detailed examinations of selected peoples and aspects of their cultures. Prerequisite: Sociology 411 or equivalent, or permission of instructor. 3 credits.

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## Social Service Courses

### 621-622. INTRODUCTION TO SOCIAL WELFARE

The field of social welfare: history, public welfare, case work, social group work, community organization for social welfare. For sociology majors and students enrolled in the social service curriculum; others may be admitted by permission of the instructor. 3 credits. (Counts for major credit in sociology at discretion of adviser.)

### 631. SOCIAL WELFARE FIELD EXPERIENCE

To give the student an understanding of social welfare through observation and participation. Students will work in a social welfare setting for a period of eight weeks (or its equivalent). This field work is generally done during the summer following the junior year. Weekly seminar sessions constitute the classroom work of the course. Prerequisite: Sociology 621-622 and permission of instructor. *Does not count for major credit in Sociology.* 6 credits.

## Sociology Courses

### (400), 400. INTRODUCTORY SOCIOLOGY

Man's social and cultural relationships as revealed in his customs and institutions. Social theory, methods and techniques of research, and current research findings. 3 credits.

### (500), 500. SOCIAL PSYCHOLOGY

Individual actions, attitudes, ideas, and perceptions as influenced by socio-cultural environments. Individual-cultural relations in education, religion, economics, aesthetics, ethics, and deviant behavior. Prerequisite: Sociology 400 or Psychology 401 or sophomore standing. 3 credits.

### (520), 520. THE FAMILY

An anthropological and institutional approach comparing customs and organizations in several societies. Not open to freshmen. 3 credits.

### (530), 530. RACE AND ETHNIC RELATIONS

Majority-minority group relations. Special attention is given to the nature and results of Negro-White and ethnic group relations in the United States. Not open to freshmen. Prerequisite: Sociology 400. 3 credits.

### (540), 540. SOCIAL PROBLEMS

How culture in the form of customs and institutions is related to such human problems as crime and delinquency, alcoholism, physical and mental disease, sex pathologies, poverty, old age, broken families, and racial and religious prejudices. *Especially for students who do not intend to major in sociology.* Prerequisite: Sociology 400. 3 credits.

### 560, (560). RURAL-URBAN SOCIOLOGY

Application of sociology principles to the study of customs and institu-

tions in rural and urban settings. Differentiation between influences upon community organization of culture on the one hand and population size and density on the other. Prerequisite: Sociology 400. 3 credits.

### 571. COMMUNICATION IN SOCIETY

Social aspects of the communication process. Cultural prerequisites of communication; premises, purposes, and procedures of communication content analysis; communication in crowd, mass, and public; the organization of mass communication systems in traditional totalitarian and democratic societies; and audience reactions to communicated messages. Prerequisite: permission of instructor. 3 credits.

### 640, 641, 642. READINGS IN SOCIOLOGY AND ANTHROPOLOGY

A three-semester reading sequence of specified books. Required of and restricted to sociology majors. 1 credit per semester.

### 695, 696. HONORS SEMINAR

Students work individually on a problem selected by the department member in charge of the seminar. A number of projects are assigned in which emphasis is placed upon the tools of academic research and upon oral and written reports. 3 credits.

### 698. SENIOR SEMINAR

Various subject areas of sociology: their growth and development, their relationship to one another, and their current status with regard to research and theory. Recent developments and the newer subject areas of sociology. Future developments as extensions of present trends. Students not majoring in sociology may be admitted by permission of the instructor. 3 credits.

### 701. STATISTICS

Use of elementary statistical techniques in analysis of prepared data. Topics surveyed include probability, discrete and continuous probability distribution, distributions of sample statistics, small sample theory, elementary analysis of variance, regression, correlation, and the chi square. 3 credits.

### 702. QUANTITATIVE METHODS OF SOCIAL RESEARCH

Analysis of research problems; designing field studies and experiments; demonstration and practice in sampling, schedule construction, and interviewing techniques. Students not majoring in sociology nor enrolled in social service curriculum may be admitted by permission of instructor. Prerequisite: Sociology 701. 3 credits.

### 703, (703). CRIMINOLOGY

The scientific study and control of crime. The following are considered; indexes, rates and theories of crime and delinquency, police, courts, probation, prison and parole. 3 credits.

**711, 712. DEVELOPMENT OF SOCIOLOGICAL THEORY**

Social thought from Plato to the present. First semester: the works of selected individuals from Plato to Comte. Second semester: the 19th Century European social philosophers; the ideas of U. S. social scientists, especially their contributions to present day sociological thought. Students not majoring in sociology may be admitted by permission of the instructor. 3 credits.

**727. PUBLIC POLICY IN SOCIAL AND LABOR LEGISLATION**

American social and labor legislation of the recent decades and the way in which American economic and human values have been implemented and modified by law. Legislation and private industry programs in social security, reemployment, unemployment insurance, health services, training and retraining, and fair employment practice. Lectures, discussion, assigned reading, and individual student projects. Prerequisite: One year's work in economics or sociology. 3 credits. (This course is the same as Economics 727.)

**740. CULTURE CHANGE**

The study of various types of society, leading to the development of a theory of culture change. Descriptive studies of institutional as well as theoretic materials selected from the writings of Comte, Marx, Spencer, Durkheim, Spengler, Sorokin, Redfield, and others. Prerequisite: Sociology 400 or permission of instructor. 3 credits.

**743. SOCIAL MOVEMENTS**

The factors related to the origin and development of reform, revolutionary, religious, and other social movements. Generalizations concerning the organization, structure, tactics, and leadership of social movements. The purposes and consequences of selected movements, as well as the relationships between social movements and social change. Prerequisite: Sociology 400. 3 credits.

**745. SOCIAL STRATIFICATION**

Nature, functions, patterns, and effects of social stratification. Social mobility. The social class system in the United States. Prerequisite: Sociology 400. 3 credits.

**761. POPULATION DYNAMICS**

Examination of major population trends including changes in birth and death rates, population characteristics, mobility, migration, world population growth, population problems and policies of countries at different stages of economic development. Emphasis is on the interrelationship of population and society. 3 credits.

**770. CULTURE, PERSONALITY, AND SOCIETY**

A cross-cultural view of the development of personality as emergent from the matrix of genetic, situational, and sociocultural determinants; and

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## Sociology

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an analysis of the dynamic interplay of sociocultural and psychological behavior system. Prerequisite: permission of instructor. 3 credits.

### 795, 796. READING AND RESEARCH IN SOCIOLOGY AND ANTHROPOLOGY

A student prepared by training and experience to do independent work under the guidance of an instructor may register for one or more of the following sections: (1) Communications, (2) Criminology, (3) Cultural Anthropology, (4) Culture Change, (5) Culture and Personality, (6) Deviant Behavior, (7) Ethnology, (8) Population, (9) Rural-Urban, (10) Social Control, (11) Social Differentiation, (12) Social Movements, (13) Social Psychology, (14) Social Research, (15) Social Theory. Prerequisite: 12 hours of sociology and permission of instructor. Hours and credit to be arranged.

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## Soil and Water Science (23)

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Allan B. Prince, *Professor and Chairman*; Gordon L. Byers, *Professor*; Nobel K. Peterson, *Associate Professor*; Francis R. Hall, *Associate Professor*; Paul A. Gilman, *Associate Professor of Soil, Water, and Construction*, Thompson School of Applied Science; Glendon Gee, *Assistant Professor*

### Soils

#### 501. INTRODUCTORY SOILS

The physical, chemical, and biological properties of soils in relation to plant growth. Mr. Peterson. 3 lectures, 1 laboratory, 4 credits.

#### 502. SOIL-PLANT RELATIONSHIPS

Soils in relation to their natural fertility, productivity, and the practices and amendments employed to maintain or increase fertility. Mr. Peterson. Prerequisite: Soil and Water Science 501 3 credits.

#### 699. THESIS

An academic year of experimental investigation and related background in a selected subject from the fields of hydrology and soil science. Advised by members of the staff. For seniors in soil and water science. Permission of adviser and department chairman is required. Credit and grade will be assigned after completion of thesis at end of second semester. 4 credits.

#### 701. METHODS OF SOIL ANALYSIS

Principles and practices of the more important physical and chemical methods of soil analysis including sampling techniques, particle size distribution, moisture retention, rheological properties, particle density, volume weight, cation exchange capacity, mineral element analysis, etc. Opportunity for experience in the application of flame photometry, spec-

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trophotometry, and isotopic tracer techniques to soil analytical problems will be provided. Mr. Prince and Mr. Gee. Prerequisite: Chem. 403-404 and Physics 401-402 or their equivalent. 1 lecture, 2 laboratories, 3 credits. (Alternate years; not offered in 1967-68.)

### 702. PHYSICS AND CHEMISTRY OF SOIL

Physical and chemical properties of soils; their measurement and relation to structure, water movement, temperature; and liberation, absorption, and fixation of elements in soils. Mr. Prince and Mr. Gee. Prerequisite: Chemistry 401-402 or Chemistry 403-404 and Physics 401-402 or their equivalent. 3 credits. (Alternate years; offered in 1967-68.)

### 704. SOIL CLASSIFICATION AND MAPPING

The genesis, morphology, classification and mapping of soils. Mr. Peterson. Prerequisite: Soil and Water 501 and Geology 401 or 407. 2 lectures, 1 laboratory, 3 credits. (Alternate years; offered in 1967-68.)

### 709. SOIL INTERPRETATION FOR COMMUNITY PLANNING

A review of the soil classification system in use in the United States. Interpretation of soils data as it affects housing, recreation, conservation, transportation, surface runoff, sewage effluent disposal, or other contamination problems. Examples of special soils maps prepared on a town or city basis for community planning. Mr. Peterson. 2 credits.

### 797-798. SOIL AND WATER SCIENCE SEMINAR

Library work and discussions on special phases of soil and water problems. Staff. Required each semester of seniors and graduate students majoring in soil and water science; elective for other qualified students. 1 credit.

## Hydrology

### 503. SOIL AND WATER CONTROL

Elementary surveying and its application to agricultural problems. The design principles, mapping, and layout of drainage, erosion control, and irrigation systems along with the presentation of construction practices for farm ponds, diversion ditches, terraces, and other mechanical methods of water control. Farmstead water systems and pumps are included. Mr. Byers. 2 lectures, 1 laboratory, 3 credits. Alternate years; not offered in 1967-68.)

### 507. INTRODUCTORY HYDROLOGY

An introduction to the field of hydrology from the viewpoint of the hydrologic cycle and hydrologic budget, with particular emphasis on drainage basins as natural hydrologic units. Topics to be covered include precipitation, evaporation, evapotranspiration, runoff, infiltration, ground water and water quality. Some consideration will be given to water law, water economics, and water problems. Mr. Hall. 3 credits.



### 703. SOIL AND WATER ENGINEERING

The hydrologic cycle, hydrograph analysis, estimating volume of run-off, surface and subsurface drainage including principles of discharge measurement, design of small water-shed dams, erosion control structures, irrigation systems. Mr. Byers. 3 credits.

### 710. GROUND-WATER HYDROLOGY

Basic principles with emphasis on physical properties of water-bearing materials, Darcy's law and the coefficient of permeability, selected steady and non-steady state solutions of the basic flow equation for ground-water motion, well hydraulics, and chemical quality of water. Mr. Hall. Prerequisite: Soil and Water Science 703 or permission of instructor. 3 credits.

### 712. HYDROLOGY LABORATORY

Includes work with fluid and electric analog models, flow measurement, seismic and resistivity techniques, chemical determinations, preparation and interpretation of water-level maps, and analysis of well tests. Mr. Hall and Mr. Byers. Prerequisite: Soil and Water Science 703 and 710 taken concurrently. 2 laboratories, 2 credits.

## Mechanized Agriculture

### 404. FABRICATION TECHNOLOGY

An introductory study of the nature of metals and plastics used in agriculture which deal specifically with heating, welding, forming, and repairing. Lectures, demonstrations, and laboratory practices are provided. Mr. Gilman. 1 lecture, 2 laboratories, 3 credits.

### 504. AGRICULTURAL POWER

Tractors, tractor engines, and electrical energy in farm work. The factors involved in the management, preventive maintenance, and repair procedures required by tractor motors and their power transmission systems. Mr. Byers. 2 lectures, 1 laboratory, 3 credits.

### 505. AGRICULTURAL MACHINERY

The selection, care, operation, and management of conventional farm machinery and processing equipment involved in the production of farm commodities. Mr. Byers. 2 lectures, 1 laboratory, 3 credits.

### 506. AGRICULTURAL BUILDINGS

The planning and design of agricultural structures for animals and crops. Construction practices, farmstead layout, building material selection and application, material estimates, heating systems, lighting, refrigeration, sewerage disposal, ventilation, environmental controls, certain phases of crop processing, and basic concepts of architectural drafting are introduced. An agricultural building problem, related to the student's major or field of interest, serves as the base for the application of all principles presented in lecture. Mr. Byers. 2 lectures, 1 laboratory, 3 credits.

## Spanish and Classics

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Charles H. Leighton, *Associate Professor and Chairman*; John S. Walsh, *Professor Emeritus*; R. Alberto Casás, *Professor*; John C. Rouman, *Assistant Professor*; Orlirio Fuentes, *Instructor*; Richard V. Desrosiers, *Instructor*; W. Scott Johnson, *Instructor*; Barbara L. Brodman, *Part-time Instructor*

### Greek (58)

New students will be assigned to the proper course on the basis of their scores on the College Board achievement test.

#### 401-402. ELEMENTARY GREEK

Grammar, composition, translation. 4 credits. (Students who offer two or more entrance units of high school work in Greek will not be permitted to register for credit for Greek 401.) *No credit toward a major.*

#### 503-504. INTERMEDIATE GREEK

Review: Plato's 'Apology'; Selections from Homer and Elegiac poets. Prerequisite: Greek 402. 3 credits.

#### 795, 796. SPECIAL STUDIES IN GREEK LITERATURE

Guided studies in special topics with training in bibliography and organization of material. Examples of topics which may be selected by instructor and student are: (1) the Greek epic, (2) Greek poetry, (3) Greek drama, (4) Greek history. Prerequisite: permission of instructor. Variable credit.

### Latin (60)

New students will be assigned to the proper course on the basis of their scores on the College Board achievement test.

#### 401-402. ELEMENTARY LATIN

Elements of grammar, reading of simple prose. The changes in meaning and form of English and Romance language derivatives from Latin. 4 credits. (Students who offer two or more entrance units of high school work in Latin will not be permitted to register for Latin 401 for credit.) *No credit toward a major.*

#### 503-504. INTERMEDIATE LATIN

A review of Latin grammar and vocabulary, followed by readings in prose and poetry. Prerequisite: Latin 402 or equivalent. 3 credits.

#### 505-506. LATIN PROSE AND POETRY

Selections from Livy, Catullus, Ovid, Phaedrus, Martial, and the odes of Horace. Translation, lectures and study of the influence of Latin on English poetry. Prerequisite: Latin 504 or equivalent. 3 credits.

## Spanish and Classics

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### 695, 696. HONORS WORK IN CLASSICS

For seniors writing a research paper in the honors program in classics. Prerequisite: permission of major supervisor. Variable credit.

### 751-752. ROMAN SATIRE

Horaces 'Satires' and 'Epistles', selected works of Persius, Juvenal, and Martial, and a study of Roman life and thought as reflected in these works. Prerequisite: Latin 506 or the equivalent. 3 credits, 4 credits for honors. (Alternate years; not offered in 1967-68.)

### 753-754. THE HISTORIANS

Livy, Suetonius, and Tacitus in selected works. Illustrated lectures and outside readings on the historical, social, and political background of Rome essential to the student or teacher of Latin. Prerequisite: Latin 506 or equivalent. 3 credits, 4 credits for Honors. (Alternate years; not offered in 1967-68.)

### 755-756. THE GOLDEN AGE

Roman literature of the classical period, particularly the work of Caesar, Cicero, and Virgil. Prerequisite: Latin 506 or its equivalent. 3 credits, 4 credits for honors. (Alternate years; offered in 1967-68.)

### LATIN-EDUCATION 792. PROBLEMS IN TEACHING HIGH SCHOOL LATIN

This course is carried on concurrently with work in composition. Prerequisite: permission of instructor and Education 758 with grade of C or better. 3 credits.

### 795, 796. SPECIAL STUDIES IN LATIN LITERATURE

Guided studies in special topics with training in bibliography and organization of material. Examples of topics which may be selected by instructor and student are: (1) Roman Comedy and Elegy, (2) The Roman Epic, (3) Roman Drama, (4) The Silver Age. Prerequisite: permission of major supervisor. Variable credit.

## Spanish (62)

New students will be assigned to the proper course on the basis of their scores on the College Board achievement test.

### 401-402. ELEMENTARY SPANISH\*

For students without previous knowledge of Spanish. Aural-oral practice, and the study of fundamental speech patterns, reading and writing to achieve a firm basis for an active command of the language. *No credit toward a major*. 5 recitations, 2 laboratories, 4 credits. (Students who offer two or more entrance units of high school work in Spanish will not be permitted to register for credit for Spanish 401.)

\* No student educated in a foreign country will be permitted to register for any Spanish course numbered 650 or below if Spanish is the student's native language.

### 503-504. INTERMEDIATE SPANISH\*

Intensive and extensive reading of complete texts of intrinsic literary and intellectual worth, formal review of the structure of the language, training in oral and written expression of ideas. Classroom discussion and papers in Spanish. 3 recitations, 1 laboratory, 3 credits. Open by placement examination, and to students who have passed Spanish 402 with a grade of C. Students making a grade of A in Spanish 504 may take courses numbered 750 and above with the permission of the department.

### 505-506. INTRODUCTION TO SPANISH LITERATURE AND THOUGHT\*

Reading and analysis of significant works in Spanish literature and thought. Outside readings on the historical and cultural background of the works read. Papers and discussion in Spanish. Term paper in English. 3 credits. This course or its equivalent is prerequisite to all higher courses in Spanish. Open to students who have achieved a grade of C or better in Spanish 504, and by placement examination. Conducted in Spanish.

### 631, 632. ADVANCED SPANISH CONVERSATION AND COMPOSITION\*

For students who wish to perfect their command of written and spoken Spanish, maintain aural-oral fluency in Spanish through intensive work in and out of the classroom, individual conferences, and laboratory sessions. Prerequisite: Spanish 503 or 504 or equivalent. 3 lectures, 2½ hour laboratory, 3 credits.

### 695, 696. HONORS WORK IN SPANISH

For seniors writing a research paper in the honors program in Spanish. Prerequisite: permission of major supervisor. Variable credit.

### 751. SPANISH LITERATURE UP TO 1600

Readings and discussion of the great human creations of early Spanish literature such as *El Poema de Mio Cid*, *El Libro de Buen Amor* and *La Celestina*, and their social and historical background. Conducted in Spanish. Prerequisite: Spanish 505 or equivalent. 3 credits, 4 credits for honors.

### 752. DRAMA AND POETRY OF THE SIGLO DE ORO

The social background of the baroque period. Readings of representative plays of Lope de Vega, Tirso de Molina, Calderon, and the poetry of Lope, Gongora and Quevedo. Development of the prose of the period. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 3 credits, 4 credits for honors.

### 754. CERVANTES

This course traces the development of Cervantes' literary art. Reading and discussion of selections from all the major works of Cervantes. Com-

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\* No student educated in a foreign country will be permitted to register for any Spanish course numbered 650 or below if Spanish is the student's native language.

## Spanish and Classics

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prehensive study of the Quijote, its originality and significance, its antecedents, its religious, philosophical and sociological aspects, and its artistic structure. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 3 credits, 4 credits for honors.

### 755. LITERATURE OF THE NINETEENTH CENTURY

Preliminary survey of the Eighteenth century and readings in and discussion of the main literary movements of the Nineteenth century. Selections from Quintana, Espronceda, Zorrilla, Larra, Duque de Rivas, Bécquer, Pérez Glados, Valera, Pereda, Clarin, and Echegaray. Social and historical background of Spain in relation to Nineteenth century thought in Europe. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 3 credits, 4 credits for honors.

### 756. CONTEMPORARY SPANISH LITERATURE

Starting with the generation of 1898, the reading and discussion of the work of such writers as Unamuno, Azorin, Baroja, Machado, J. R. Jiménez, Ortega y Gasset, Garcia Lorca, Pérez de Ayala, Benavente, Casona, plus a survey of Spanish literature and thought since 1939. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 3 credits, 4 credits for honors.

### 765, 766. SPANISH-AMERICAN LITERATURE

The main themes of Spanish-American literature studied in the works of its most representative authors and against the historical, social and geographical background of the New World. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 3 credits, 4 credits for honors.

### 795, 796. SPECIAL STUDIES IN SPANISH LANGUAGE AND LITERATURE

Individual guided study in special topics, with training in bibliography and organization of material. Examples of topics that may be selected by instructor and student in conference are: (1) 18th, 19th or 20th century literature in Spain; (2) literature and civilization in Spain in the Golden Age; (3) the literature of individual Latin-American countries. Conducted in Spanish. Prerequisite: permission of major supervisor. Variable credit.

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## Speech and Drama (69)

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Joseph D. Batcheller, *Professor and Chairman*; Edmund A. Cortez, *Professor Emeritus*; John C. Edwards, *Associate Professor*; Mason P. Wakstein, *Assistant Professor*; Gilbert B. Davenport, *Assistant Professor*; Frederick Murray, *Assistant Professor*; William O. Gilsdorf, *Instructor*; Judith Rosenbaum, *Instructor*; Judith K. Davenport, *Lecturer*; Marianne H. Jaffe, *Lecturer*; Dorothy Aldrich, *Lecturer*; Alice Bowes, *Adjunct Instructor*



### 301. SPEECH IMPROVEMENT

All entering freshmen and transfer students are required to take a speech test. They are classified as Group I, having no apparent problem; Group II, needing speech improvement; or Group III, having a relatively serious speech problem. Those students classified in Group III are required to meet individually or in groups with the staff and students in clinical practice for non-credit speech improvement until such time as they have made sufficient improvement. A student may be remanded to speech improvement by any instructor with the approval of the Speech staff. Mrs. Jaffe and Mr. Murray. No credit.

### 401, (401). BASIC SPEECH

The social, psychological, physiological, and phonetic bases of speech. Projects in informal public speaking, oral interpretation, discussion, and elementary phonetic transcription to illustrate the bases and for the improvement of the individual student. Strongly recommended for those students who are classified in Group II on the speech test. Required of all majors, but without major credit. Staff. 3 credits.

### 403, (403). SPEECH COMMUNICATION

An analysis of the process of speech communication, emphasizing the relationship between the speaker and his listeners. Presentation of ideas and materials in terms of organization, choice of language, adaptation to audience, delivery techniques, and theory of persuasion. Practice in the various forms of speaking with evaluation by instructor and audience. Staff. 3 credits.

### 431. INTRODUCTION TO THEATER ARTS

The basic elements common to the varied media of theater; legitimate, musical, cinema, and television. The place of the theater in our lives. An introduction to theater practices from the script to production. Mr. Batcheller and Mr. Davenport. 2 lectures, 1 laboratory, 3 credits.

### 436. THEATER AND ITS DRAMA

The relation of theater and its drama to the society in which it is produced. A comparative study of outstanding modern plays and historical counterparts. Mr. Batcheller and Mr. Edwards. 2 or 3 lectures, 1 laboratory, 3 credits.

### 457. ORAL INTERPRETATION OF LITERATURE

The analysis of literature as a basis for performance; demonstration and experimentation with methods of performance which will enhance particular pieces of literature; the development of a critical standard for evaluation performance, and, consequently, literature. Mr. Edwards. 3 credits.

### 459, (459). STAGECRAFT

Stage and television scenery, costumes, properties, lighting, sound, and



## Speech and Drama

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backstage organization. Practical application in University Theater productions. Mr. Davenport. 1 lecture, 2 laboratories, 3 credits.

### 503. DISCUSSION

The means and ends, values, and limitations of the various types of discussion. Group dynamics, logic and evidence, and parliamentary procedure as applied to learning and problem solving. Practice in using various methods to gain the objectives of discussion. Mr. Gilsdorf. 3 credits.

### 504. DEBATE

The various forms of advocacy as an extension of discussions. The analysis of propositions, the construction of a case, logic and ethical persuasion, and the presentation of speeches of advocacy. Mr. Gilsdorf. 3 credits.

### 508. SPEECH FOR PROSPECTIVE TEACHERS

Developing an adequate conversational form of speaking before the class; speech improvement for the prospective teachers; voice recording and analysis; oral interpretation of both prose and poetry; making and using visual aids; and the means of developing a communicative speaker-audience relationship. Staff. 3 credits.

### 521. SPEECH AND VOICE SCIENCE

Anatomy and physiology of the vocal and auditory mechanisms. Neurological basis of speech. Study of the processes of respiration, phonation, resonance, articulation, and audition. Staff. 3 credits.

### 524. PHONETICS OF AMERICAN ENGLISH

An introduction to phonetics through the use of the international phonetic alphabet primarily in the analysis of the sounds of American English. Study and transcription of American and foreign dialects in conjunction with the professional interest of the student. Mrs. Jaffe. 3 credits.

### 531. SPEECH CORRECTION

Further study of the psychological, physiological, and phonetic bases of speech with the addition of the neurological, genetic and physical bases towards the end of recognizing abnormalities of speech, some of their causes, and their basic therapy. Delayed speech, articulatory and voice disorders, foreign dialects, stuttering, aphasia, cerebral palsy, and audiology are the principal problems studied. Prerequisite: basic speech or permission of instructor. Mr. Murray. 3 credits.

### 551. ACTING I

Basic movement and vocal training for the actor. Historical development of acting. Relation of actor to writer, director and audience. Prerequisite: 6 credits in speech and drama or permission of instructor. Mr. Edwards. 1 lecture, 2 laboratories, 3 credits.

### 552. ACTING II

A continuation of 551 with concentration on characterization and development of the actor's skills. Prerequisite: 551 or the equivalent. Mr. Edwards. 1 lecture, 2 laboratories, 3 credits.

### 555. TELEVISION AND RADIO WORKSHOP

The application of basic theater techniques to electronic means of mass communication. The place of television and radio in our society. Production techniques. Actual practice in campus studios. Mr. Gilsdorf. 1 lecture, 2 laboratories, 3 credits.

### 601, (601). SPEECH PRACTICE

Application of the theory of specific speech areas, other than theater, i.e., discussion, debate, speech and hearing therapy, in individual or group projects. May be repeated to 8 credits toward graduation but cannot be counted for major credit. Prerequisite: the basic courses in which practice credit is taken and permission of instructor. Mr. Batcheller and Staff. 1-3 credits.

### 605. BASES OF THEATER ARTS

The fundamental factors common to all types of theater art with emphasis upon appreciation through involvement as well as theoretical study. Not open for credit to students who have taken Speech and Drama 431. (Summer Session only.) 3 credits.

### 611. RHETORIC IN THE WESTERN WORLD

Great speeches in the history of western civilization; an analysis of the reasons for their success or failure on a basis of the speaker, his materials, the logical and persuasive appeals, the audience background and attitude, and the occasion. Of special interest to history, political science, sociology, and psychology majors as well as students interested in relationships of language and social problems. Prerequisite: 6 credits in speech and drama or approval of the instructor. 3 credits. (Alternate years.)

### 617. ORAL INTERPRETATION OF LITERATURE

Prose and poetry with the view of problems which will be found in the performance of selected works. Reading performances, solo and group performances, with attention to problem of high school teachers of literature and speech. (Summer Session only.) 3 credits.

### 621. CREATIVE DRAMATICS

The theory and technique of teaching creative dramatics, introducing methods useful to classroom teachers, art and music teachers, special teachers, recreation specialists, and therapists. The study of guided child improvisation, including drama appreciation, storytelling, story dramatization, integration of the arts and puppetry. Includes observation of classes taught by a master teacher and practical application of theory.

## Speech and Drama

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### 622. THEATER FOR CHILDREN

The art of children's theater production for both school and recreation programs. Students will observe and take part in the production of a play for children. Mrs. Davenport and Mrs. Aldrich. 3 credits.

### 632. CLINICAL METHODS

A continuation of speech correction dealing with the theory of remedial practices for various speech problems and providing experience in speech therapy by demonstration and laboratory in conjunction with speech improvement. Prerequisite: speech correction. Staff. 1 lecture, 2 laboratories, 3 credits. (Alternate years.)

### 634. PROCEDURES AND PRACTICES IN REHABILITATION METHODS

Student experience in diagnosis and therapy of speech handicapped children and adults. Theory of the problems of differential diagnosis and special therapeutic techniques. Clinical affiliation under supervision emphasizing preparation, administration and discussion of therapy lessons, parent conferences, staff conferences, and continued observation of techniques in diagnosis and treatment. Prerequisite: clinical methods. Staff and Mrs. Bowes. 1 lecture, 1 laboratory, 3 credits.

### 638. LANGUAGE AND SPEECH DEVELOPMENT

An examination of the pertinent research in the acquisition of language and speech in the normal child. Physical, intellectual, social, cultural, linguistic, and psychological processes are considered. Individual measurement and observation of children's language functioning. Prerequisite: permission of instructor. Mr. Wakstein. 3 credits.

### 641. THEATER PRACTICUM

Roles, production techniques, etc., combining class lecture and demonstration with actual rehearsal and production experience in the Summer Theater program. This course and/or Speech and Drama 655 may be repeated to a total of 8 credits toward graduation. (Summer Session only.) 3 credits.

### 643. SPEECH FOR TEACHERS IN SERVICE

Unit one: voice analysis and recordings; pronunciation, enunciation, speech rate, pitch changes, inflections, quality. Unit two: interpretative speech; poetry, prose, story; the manuscript; the techniques of delivery on stage and radio. Unit three: choice speech for lower and upper grades and for adults. Unit four: forms and requirements of public address. Unit five: simple parliamentary procedure. Unit six: topic or area suggested by the class (optional). For juniors, seniors, or graduate students. (Summer Session only.) 3 credits.

### 645. EDUCATIONAL TELEVISION WORKSHOP FOR TEACHERS

Basic philosophy of educational television; studio equipment and techniques; use of lighting facilities and cameras; methods of producing a

TV program; use of films; lay-out of a TV program for a school system; magnetic sound recording; laboratory experience with the facilities of WENH-TV; educational trips to metropolitan TV stations; guest lecturers. (Summer Session only.) 3 credits.

### 647. PLAY PRODUCTION IN HIGH SCHOOL

The stage as an environment of the action of a script. Problems of scenery, lighting, costumes, properties, and sound effects as applied to the high school situation. Application in laboratory and public performance. (Summer Session only.) 3 credits.

### 649. PRINCIPLES AND METHODS OF DRAMA

The philosophy of educational theater. Courses of study and extra-curricular programs. The problems of dramatic activities. Practical solutions applied in laboratory and public performance sessions. (Summer Session only.) 3 credits.

### 652. SCENIC DESIGN AND LIGHTING

A study of the problems of stage design and lighting for theater and television. Individual projects, models, and participation in University Theater and television productions. Prerequisite: stagecraft or permission of instructor. Mr. Davenport. 1 lecture, 2 laboratories, 3 credits.

### 655, (655). THEATER PRACTICE

Application of the theory of acting, directing, or the technical aspects of production to specific assigned responsibilities in University Theater productions. This course and/or Speech and Drama 641 may be repeated to a total of 8 credits toward graduation, but cannot be counted for major credit. Prerequisite: the basic courses in which the practice credit is taken and permission of instructor. Mr. Batcheller and Staff. 1-3 credits.

### 658. DIRECTING

The analysis of the script, the determination of specific treatment of the production, the development of a prompt script, casting, rehearsal, and production for legitimate theater and television. Prerequisite: 6 credits in speech and drama or permission of instructor. Mr. Edwards. 1 lecture, 2 laboratories, 3 credits.

### 704. AUDIOLOGY

Attributes of sound and the mechanism of hearing as they pertain to classical study of science of audiology. Elementary physics of sound and the decibel; anatomy of the aural mechanism; essentials of hearing theory; pathologies of the auditory and related systems; basic pure tone audiometry technique. Prerequisite: permission of instructor. Mr. Wakstein. 3 credits.

## Speech and Drama

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### 706. SPEECH READING AND AUDITORY TRAINING

Principles, techniques, and materials for teaching speech reading to the hard-of-hearing and deaf individual. Classical speech reading procedures surveyed. Emphasis given to the combined approach of speech reading, auditory training and speech/language development. Prerequisite: Speech and Drama 521, 524 or permission of instructor. Mr. Murray. 3 credits.

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## Technology (79)

### 401. PROBLEMS IN ENGINEERING

*Tech 79 395* *Naughton Work Experience (PNS Prog) students (out)*  
To acquaint students with the broad scope of the engineering profession and to help them develop the ability to analyze, to formulate, and to solve engineering problems. The relation of engineering problems to problems and techniques from science and mathematics. Although the problems considered must be relatively simple because of the limited experience of students, they are true engineering problems designed to demonstrate that engineering problems, in general, may have many possible solutions and that professional decisions must often be based on limited data. The use of machine computation techniques are discussed and each student may use the IBM 1620 Computer to solve a simple problem. The course is directed by a committee consisting of Mr. Zimmerman, Mr. Winn, and Mr. Zoller, and Mr. Corell; lectures on various phases of engineering and related fields are also given by other engineering faculty members. Required of new freshmen engineering students, but it may be elected by freshmen majoring in mathematics or the physical sciences or by other freshmen who wish to learn more about the activities of engineers. 3 credits.

### 601. STATISTICAL METHODS IN ENGINEERING AND PHYSICAL SCIENCE

Methods of organizing data and statistical techniques for data analysis as applied to problems in engineering and physical science. Elementary probability theory and probability distributions. Correlation and regression analysis. Design of experiments; factorials, fractional factorials, designs for process optimization. Introduction to quality control; construction and analysis of control charts for variables and attributes; statistical aspects of tolerance. 3 credits.

### 780, (780). ENGINEERING ANALYSIS

The basis principles and analytical methods employed in the solution of complex problems in the various branches of engineering. Prerequisite: permission of instructor. 2-3 credits.

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## Zoology (70)

Paul A. Wright, *Professor and Chairman*; C. Floyd Jackson, *Professor Emeritus*; Edythe T. Richardson, *Professor Emeritus*; George M. Moore, *Professor*; Lorus J. Milne, *Professor*; Wilbur L. Bullock, *Professor*; Emery F. Swan, *Professor*; Paul E. Schaefer, *Associate Professor*; Philip J. Sawyer, *Associate Professor*; Marcel E. Lavoie, *Associate Professor*; Arthur C. Borror, *Associate Professor*; Burton C. Staugaard, *Assistant Professor*; Frank K. Hoornbeek, *Assistant Professor*; John J. Sasner, *Assistant Professor*; Robert A. Croker, *Assistant Professor*; Edward N. Francq, *Instructor*

### 412. PRINCIPLES OF ZOOLOGY

Concepts of animal biology, including ecological relationships, anatomy, physiology, embryology; taxonomy, and evolution. Mr. Swan. Prerequisite: Biology 405 or Botany 411. 2 lectures, 2 laboratories, 4 credits.

### 507-508. MAMMALIAN ANATOMY AND SYSTEMIC PHYSIOLOGY

The anatomy and physiology of mammals with a strong emphasis on man's morphological heritage and relationships. Mr. Lavoie. Prerequisite: Biology 402 or Zoology 412. 3 lectures, 1 laboratory, 4 credits.

### 510. FUNCTIONAL ANATOMY AND NEUROLOGY

The anatomy and physiology of those systems of the human body which are not covered by Zoology 507, with special emphasis on the nervous system. Enrollment limited to Occupational Therapy students. Mr. Lavoie. Prerequisite: Zoology 507. 3 lectures, 1 laboratory, 4 credits.

### 512. ORNITHOLOGY

Birds, their identification, migration, life histories, and economic importance, with special reference to those of eastern North America. Mr. Borror. Prerequisite: Biology 402 or equivalent. 1 lecture, 2 laboratories or field trips; 3 credits.

### 530. ZOOLOGICAL TECHNIQUES

A functional background of specialized technical procedures useful for research and study in zoological areas. Topics will include preservation, fixation, sectioning, staining, microscopy, photomicrography, and use of such instrumentation as is available and depending on the needs of the students enrolled. Prerequisite: Biology 402 or Zoology 412 and permission of instructor. 1 lecture, 2 laboratories, 3 credits.

### 610. INTRODUCTION TO PATHOLOGY

Concepts of the effect of disease on the body, emphasizing variations in anatomy, physiology, and biochemistry. Consideration of inflammation, infection, mechanical injury, vascular disturbances, degenerations, congenital defects, neoplasms, endocrine, and functional disturbances. Allen



## Zoology

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W. Handy, M.D., and Paul C. Young, Jr., M.D. Prerequisite: Zoology 508 or 510 taken concurrently. 1 lecture, 1 credit. *No credit toward a major.*

### 701. (701). PRINCIPLES OF ECOLOGY

The interrelationships of plants and animals with both their living and non-living environments. Energy relationships, limiting factors, community organization, succession, and biogeography. Staff. Prerequisite: Zoology 412 or equivalent. 3 credits.

### 704. COMPARATIVE ENDOCRINOLOGY

The various endocrine organs, vertebrate and invertebrate, with particular emphasis on endocrines which relate to physiology of reproduction. Mr. Wright. Prerequisite: Zoology 508 or equivalent and organic chemistry. 3 credits.

### (706). GENETICS

The physical basis of inheritance, expression, and interaction of the hereditary units, linkage, and variation. The application of Mendelian principles of plant and animal breeding. Mr. Hoornbeek. Prerequisite: Zoology 412 or equivalent. 3 lectures, 3 credits; with laboratory, 4 credits. Laboratory required of Zoology majors; optional for others.

### 711. NATURAL HISTORY OF COLD-BLOODED VERTEBRATES

The various classes of poikilothermic vertebrates, their habits, habitats, and life histories with special reference to those occurring in eastern North America. Mr. Sawyer. Prerequisite: general zoology and Zoology 508. 2 recitations, 2 laboratories, 4 credits.

### (712). MAMMALOGY

The origin and diversification of mammals, their ecology and economic importance. Laboratories will emphasize techniques of the mammalogist and identification of local forms. Mr. Francq. Prerequisite: general zoology and Zoology 508. 2 lectures, 1 laboratory, 3 credits.

### (713). ANIMAL BEHAVIOR

Individual and group behavior patterns of animals with the role of anatomy, physiology, and prior experience emphasized. Techniques and the practical application of the study of animal behavior. Mr. Francq. Prerequisite: One year of zoology. 3 credits.

### 715. NATURAL HISTORY OF MARINE INVERTEBRATES

A field and laboratory course aimed at acquainting the student with the inshore marine invertebrate metazoan animals of northern New England. Emphasis will be on identification, classification, habitat preferences, and behavior of these animals. Field work (collections and observation) will constitute a major part of the course and the student must be prepared to assume some travel expense. Mr. Moore. Prerequisite: general zo-

ology. 1 lecture, 3 laboratories, 4 credits. (Also offered in Summer Session annually.)

**721. PARASITOLOGY**

An introductory course on some of the more important parasites causing diseases of man and animals. Living materials will be used as far as possible. Mr. Bullock. Prerequisite: One year of zoology. 2 lectures, 2 laboratories, 4 credits.

**725. GENERAL PHYSIOLOGY**

The fundamental physiological properties of excitability, contractility, conductivity, metabolism, growth, and reproduction. Mr. Sasner. Prerequisite: One year of zoology and organic chemistry. 3 lectures, 1 laboratory, 4 credits.

**729. VERTEBRATE EMBRYOLOGY**

The fundamental principles of vertebrate development up through establishment of the principal organs and systems, exemplified in the laboratory by study of representative embryonic forms. Prerequisite: general zoology. 2 lectures, 2 laboratories, 4 credits.

**730. ELEMENTS OF HISTOLOGY**

The microscopic anatomy of principal tissues and organs of vertebrates with an introduction to general histological techniques. Mr. Bullock. Prerequisite: Zoology 508 or equivalent or permission of instructor. 2 lectures, 2 laboratories, 4 credits.

**795, 796. SPECIAL PROBLEMS IN ZOOLOGY**

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|--------------------------|---------------------------|
| 1. Bibliographic Methods | 10. Physiology            |
| 2. Ecology               | 11. Vertebrate Zoology    |
| 3. Endocrinology         | 12. Zoogeography          |
| 4. Evolution             | 13. Zoological Techniques |
| 5. Embryology            | 14. Parasitology          |
| 6. Genetics              | 15. Histochemistry        |
| 7. Histology             | 16. Protozoology          |
| 8. History of Zoology    | 17. Systematics           |
| 9. Invertebrate Zoology  | 18. Animal Behavior       |

Election of one or more sections of this course provides opportunity for advanced study. Work may involve reading, laboratory work, organized seminars, and/or conferences. Prerequisite: permission of department chairman and staff concerned. 1-6 credits. (Limit of 12 credits from the sections of this course.)

# Summary of Registration

	Agriculture				Liberal Arts				Technology				Whittemore School			
	1965-66	1964-65	1963-64	1962-63	1965-66	1964-65	1963-64	1962-63	1965-66	1964-65	1963-64	1962-63	1965-66	1964-65	1963-64	1962-63
<b>Regular Curricula</b>																
Senior	66	62	58	49	548	543	470	436	141	158	164	113	100	76	97	69
Junior	59	72	69	65	609	600	606	537	129	141	222	168	93	112	77	84
Sophomore	92	71	88	79	912	702	718	709	193	153	153	190	93	107	82	58
Freshman	129	78	79	79	1263	1019	759	765	255	237	186	164	116	98	97	58
Special		10	6	7		75	119	64		15	21	13		4	14	5
Graduate																
<b>Total — regular curricula</b>	346	293	300	279	3332	2939	2672	2511	718	704	746	648	402	397	367	274
<b>Associate degree curricula</b>																
2nd Year, T.S.A.S.	63	59	55	38												
1st Year, T.S.A.S.	145	99	103	95												
Special, T.S.A.S.		6	5	1												
<b>Total</b>	208	164	163	134												
<b>Short Curricula</b>																
Summer School																
Extension courses																
Credit																
Non-credit																
General Electric <sup>A</sup>																
<b>Total — short curricula</b>	208	164	163	134												
<b>Grand Totals</b>	554	457	463	413	3332	2939	2672	2511	718	704	746	648	402	397	367	274

\* Beginning September 1963, GE students register as regular students.

# Summary of Registration — Continued

	Other				Men				Women				Both			
	1965-66	1964-65	1963-64	1962-63	1965-66	1964-65	1963-64	1962-63	1965-66	1964-65	1963-64	1962-63	1965-66	1964-65	1963-64	1962-63
<b>Regular Curricula</b>																
Senior					493	494	489	409	362	345	300	258	855	839	789	667
Junior					483	526	575	500	407	399	399	353	890	925	974	853
Sophomore					724	567	586	591	566	466	455	446	1290	1033	1041	1037
Freshman					947	802	628	576	816	630	493	490	1763	1432	1121	1066
Special	127				57	48	77	45	70	56	83	44	127	104	160	89
Graduate	677	727	604	554	528	526	442	435	149	201	162	119	677	727	604	554
<b>Total — regular curricula</b>	804	727	604	554	3232	2963	2797	2556	2370	2097	1892	1710	5602	5060	4689	4266
<b>Associate degree curricula</b>																
2nd Year, T.S.A.S.					63	58	101	31		1	2		63	59	103	31
1st Year, T.S.A.S.					135	96	53	97	10	3	2	5	145	99	55	102
Special, T.S.A.S.						5	2	1		1	3			6	5	1
<b>Total</b>					198	159	156	129	10	5	7	5	208	164	163	134
<b>Short Curricula</b>																
Summer School	1791	1850	1722	1517	1035	1051	1014	855	756	799	708	662	1791	1850	1722	1517
Extension courses																
Credit	3553	3651	3669	3593	2197	2450	2333	2499	1356	1201	1336	1094	3553	3651	3669	3593
Non-credit	670	725	977	721	411	599	767	581	259	126	210	140	670	725	977	721
General Electric*		24	8	37		24	8	37						24	8	37
<b>Total — short curricula</b>	6014	6250	6376	5868	3643	4124	4122	3972	2371	2126	2254	1896	6014	6250	6376	5868
<b>Grand Totals</b>	6818	6977	6980	6422	7073	7246	7075	6657	4751	4228	4153	3611	11824	11474	11228	10268

\* Beginning September 1963, GE students register as regular students.

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# Index

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- Academic requirements 73  
Administrative divisions 54  
Administrative officers 10  
Admissions 63  
Agricultural Education 76, 179  
Agricultural Engineering 82, 318  
Agriculture College 74  
Aerospace Studies 306  
Animal Sciences 77, 180  
Anthropology 312  
Art Education 120, 190  
Arts, The 99, 184  
Astronomy 292
- Bachelor of Arts 99  
Bachelor of Music 142  
Bachelor of Science 76, 83, 85, 119  
Biochemistry 78, 191  
Biology 101, 192  
Board of Visitors,  
Whittemore School 172  
Botany 78, 102, 192  
Business Administration 166, 195
- Calendar 4  
Chemical Engineering 148, 199  
Chemistry 103, 150, 201  
Child Development and Family  
Life 245  
Civil Engineering 152, 204  
Classics 116  
Clothing and Textiles 246  
College Board Scholastic  
Aptitude Test 63  
Consumer Science 87  
Courses 175  
Crafts 100, 184
- Dairy Science 77, 180  
Degree Requirements  
College of Agriculture 76  
College of Liberal Arts 97, 119  
College of Technology 146  
Whittemore School of Business  
and Economics 163  
Dental, Pre- 93  
Dining Services 67  
Doctor of Philosophy degrees 173  
Drama 117, 322  
Dual degree program 75, 97,  
147, 165
- Earth Science 104  
Economics 104, 208  
Education 104, 168, 211  
Electrical Engineering 154, 215  
Elementary Education 95  
English 105, 218  
Entomology 79, 105, 222  
Expenses 66
- Facts About the University 59  
Faculty 11  
Family Life Education 86  
Family Service 87  
Fees 66  
Financial Aid 68  
Food and Nutrition 247  
Ford Foundation program 96, 164  
Forestry 83, 223  
French 106, 227
- General Information 59  
General Physical Science 106
-

- 
- General Studies 79  
Geography 106, 233  
Geology 107, 230  
German 108, 235  
Government (See Political Science)  
Graduate School 173  
Greek 319
- History 108, 239  
History of Art 100, 189  
Home Economics 85, 244  
Home Economics Education 248  
Honors Program  
    in Agriculture 75  
    in Liberal Arts 96  
    in Technology 147  
Hotel Administration 170, 249  
Housing 67  
Humanities 250  
Hydrology 81, 317
- IBM Key Codes 177  
Independent study plan 163  
Internships in Social Sciences 311  
Italian 227
- Languages 250  
Latin 319  
Law, Pre- 93  
Liberal Arts College 90  
Loans 68
- Management and Housing 248  
Master's degree 173  
Mathematics 109, 156, 251  
Mechanical Engineering 158, 256
- Mechanized Agriculture 82, 318  
Medical Technology 122  
Medical, Pre- 93  
Microbiology 110, 261  
Military Science 304  
Music 110, 142, 263  
Music Education 124, 271
- New England Board of  
    Higher Education 64  
Nursing 126, 272  
Nutrition 247
- Occupational Therapy 128, 273
- Painting and Graphics 100, 187  
Philosophy 111, 276  
Photography 187  
Physical Education  
    for Men 132, 280  
    for Women 136, 284  
Physical Science 289  
Physics 112, 160, 289  
Plant Science 79, 292  
Political Science 113, 295  
Poultry Science 77, 180  
Pre-Dental 93  
Pre-Law 93  
Pre-Medical 93  
Preparation for Teaching 94  
Pre-Veterinary 78  
Professional staff 50  
Psychology 114, 301
- Recreation and Parks 138  
Regional cooperation program 64
-



---

Registration summary 332  
Reserve Officers' Training Corps 304  
Resource Economics 80, 309  
Russian 238

Scholarships 68  
Secretarial 311  
Social Science 311  
Social Service 140, 313  
Sociology 115, 312  
Soil and Water Science 81, 316  
Spanish 116, 319  
Speech and Drama 117, 322  
Student Workshop 184  
Supervised Teaching 95

Teacher Education 36, 104  
Technology College 145  
Thompson School of  
Applied Science 89  
Trustees 9

Tuition 66  
Tuition grants 68

University academic  
requirements 73  
University Teacher Preparation  
Program 94

Veterinary, Pre- 78  
Whittemore School of Business  
and Economics 162  
Wildlife Management 82, 223

Zoology 118, 329

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The University of New Hampshire

# Supplement to the 1968-1969 Catalog

September 1968



Office of the  
Registrar

This Supplement contains a list of the courses which have been added, deleted, or modified since the publication of the 1963-1969 University Catalog. This list should be used in conjunction with that catalog and with the Time and Room Schedule, First Semester, 1968-1969. (All available copies of the 1963-1969 University Catalog have been distributed.)

**401. Introduction to the Animal Sciences—Added**  
To acquaint the beginning student with the development, economic importance, and problems facing the livestock industry. The commercially important classes of farm animals are discussed with emphasis on dairy cattle, poultry, beef cattle, horses, sheep and swine. The place of the Biological Sciences in the rapidly changing animal agriculture is stressed. The course is intended to be the introduction to subsequent specialized courses and gives the student an insight into opportunities in the Animal Agriculture field. Mr. G. L. Smith and Staff. 3 lectures; 1 laboratory; 4 credits.

**401. Fundamentals of Dairying—Deleted**

This is being eliminated since the material will be included in the New 401.

**402. (402). Horsemanship—Modified**

Instruction in riding using University owned Morgan under supervision of a riding instructor. Any student wishing to use this course to satisfy an activity requirement in Physical Education for Women will register for Physical Education 401, 402, 403, or 404. Three hours of riding instruction per week for which a fee of \$35.00 per quarter is charged. Mrs. Briggs. 1 credit.

**402. Introduction to the Livestock Industry—Deleted**

This course is being eliminated since the material will be included in Animal Science 401.

**403. Poultry Production—Deleted**

This course is being eliminated since the material will be included in Animal Science 401.

**Deleted**

This course will be renumbered 402 (402).

**502. Animal Diseases—Deleted**

The title for this course will be changed to Fundamentals of Animal Health.

**502. Fundamentals of Animal Health—Modified**

The prevention, control and treatment of the bacterial and parasite diseases of domestic animals. Mr. Allen.

Prerequisite: Animal Science 501 or permission of instructor. 3 credits.

**505. Light Horse Science—Deleted**

This number will be dropped and the material included in Management of the Domestic Animal. 1. Light Horse 651-1

**508. Milk and Its Products—Added**

The composition and properties of milk both chemical and bacteriological. The producing, making, handling and marketing of milk and its products.

Mr. Moore. 3 lectures; 1 laboratory; 4 credits.

**508. Dairy Bacteriology—Deleted**

This course will be eliminated and the material combined with material from 607 and 608 which will also be eliminated and offered in the new 508. . . . Milk and Its Production.

**509 (510). Principles of Judging—Deleted**

This course will be replaced by Animal Selection 601-602.

**601-602. Animal Selection—Added**

601-1 Livestock: Mr. Riker, 602-2 Dairy Mr. Boynton, 602-3 Poultry: Mr. Collins. The principles of selection based on production performance, pedigree and type evaluation. Elective only after consultation with instructor in charge. The student can select any or all of the specialized areas listed above.

each area. 1 lecture; 1 laboratory;  
2 credits.

**602. Livestock Management—Deleted**

This course will be replaced by 652-3 Management of the Domestic Animals. — Livestock.

**605. Physiology of Reproduction—Deleted**

This course will be changed to 701 as it is geared for graduate students and advanced undergraduates.

**607. Market Milk—Deleted**

This course will be eliminated and the material combined with material from 508 and 608 which will also be eliminated and offered in the new 508 — Milk and Its Products.

**608. Ice Cream, Butter and Cheese—Deleted**

This course will be eliminated and the material combined with material from 508 and 607 which will also be eliminated, and offered in the new 508 — Milk and Its Products.

**609. Dairy Cattle Breeding Principles—Deleted**

This course will be eliminated and phases of it included in other courses.

**610. Poultry Management— Deleted**  
This course will be replaced by 652 Management of the Domestic Animals. — Poultry.

**612. Avian Diseases—Deleted**  
The title for this course will be changed to Avian Health and Sanitation.

**612. Avian Health and Sanitation—Modified**

This is simply changing the course title from Avian Diseases to the one listed above. Mr. Corbett and Mr. Strout. 3 lectures; 1 laboratory; 4 credits.

**Wildlife—Added**

This course was formerly numbered 714 and is being renumbered to eliminate it as a graduate course.

**651, 652. Management of the Domestic Animals—Added**

651-1 Light Horses: Mr. Riker, 651-2 Dairy: Mr. Woefel, 652-3 Livestock: Mr. G. L. Smith, 652-4 Poultry: Mr. Skoglund. A study of the economic and management factors involved in the production of the various species of domestic animals. The student can select any or all of the specialized areas listed above. Elective only after consultation with the instructor in charge. 3 lectures; 1 laboratory; 4 credits.

**653-654. Principles of Teaching Equitation—Added**

The techniques and procedures of teaching equitation. Application of the theories of riding and training with emphasis on dressage instruction. Opportunity will be given to teach riding theory and techniques to college students under the supervision of the head instructor. Must be taken for both first and second semesters. Prerequisite: Animal Science 402; Animal Science 507; Animal Science 651. Permission of Mrs. Briggs, Instructor. 3 credits.

**701. Physiology of Reproduction—Modified**

A study of physiology, embryology, endocrinology, reproduction and lactation in domestic animals. Mr. Fowler. 3 lectures; 1 laboratory; 4 credits.

**703. Animal Genetics—Deleted**

This course will be renumbered 708 and the credits increased to 4.

**708. Animal Genetics—Added**

Mendelian and quantitative inheritance in animals; principles and systems of

genetics or permission of instructor.  
Mr. Collins. 3 lectures; 1 laboratory;  
credits.

#### **14. Diseases and Parasites of Wildlife—Deleted**

This course is being renumbered 614 as  
it should not be offered at 700 level.

#### **The Arts (46)**

**431. Basic Design—Modified**  
Former Arts 431 redesigned and credit  
changed from 2 to 3.

**432. Beginning Drawing—Modified**  
Former Arts 432 redesigned and credit  
changed from 2 to 3.

#### **Biochemistry (26)**

**770. Biochemical Genetics—Added**  
The biochemical mechanisms of storage,  
replication, transmission, transcription,  
recombination, mutation and expression  
of genetic information by cells and  
viruses. Mr. Green. Prerequisite:  
Biochemistry 751 or 756 or permission  
of instructor. 2 lectures; 2 credits.

**772. Biochemical Genetics  
Laboratory—Added**  
Experimental techniques applicable to  
the study of genetics at the biochemical  
level. To be taken in conjunction with  
Biochemistry 770. 2 laboratories;  
2 credits.

**850. Physical Biochemistry—Added**  
The physical chemistry of biological  
molecules with emphasis on the  
structure and properties of proteins.  
Beginning with the physico-chemical  
properties of water and the amino acids,  
discussion will proceed to the primary  
structure, conformation, and interactions  
of proteins. Included will be a  
consideration of the theory and  
applications of physical methods such  
as x-ray diffraction, optical rotation,  
spectra, sedimentation and light  
scattering. Mr. Klippenstein.  
Prerequisite: Physical Chemistry and  
General Biochemistry. 2 credits.

**Laboratory—Modified**  
Application of chemical and physical  
techniques to the purification and  
characterization of proteins and  
nucleic acids. Separation methods  
including various types of  
chromatography and electrophoresis  
will be used. Ultracentrifugation,  
spectroscopy, osmometry, and  
viscometry will be among the  
techniques employed to study  
macromolecular structure. To be taken  
in conjunction with Biochemistry 850.  
Mr. Klippenstein. 2 laboratories;  
2 credits.

#### **Biology (41)**

**612. Biology for Science Teachers—  
Added**

A study of readily available forms,  
principally insects, which have particular  
application for use in school science  
courses, concentrating upon living  
organisms in both field and  
laboratory. Mr. Schaefer. Prerequisite:  
Two biology courses or permission.  
2 recitations; 2 laboratories; 4 credits.

#### **Botany (27)**

**797-798. Botany Seminar—  
Modified**

Library reference work and the  
preparation of papers and abstracts.  
Practice in the preparation of oral and  
written reports. Botany staff. Prerequisite:  
6 hours of botany, or permission of the  
Department Chairman. Non-credit.

#### **Business Administration (71)**

**502. Financial Accounting—Modified**  
A general introduction to the objective  
theories, conventions, and processes for  
portraying and communicating the  
financial status and progress of the  
business enterprise. Mr. Horrigan, Mr.  
Wetzel. 3 credits.

**730. Organizational Change—Added**  
Examination of the process of change in  
organizations. Consideration of change  
strategies, the role of the change agent



the bases of resistance to change and the problems encountered by internal and external change agents. Readings include theoretical material on influence and attitude change as well as organizational change. Offered subject to faculty approval. Mr. Jenks. 3 credits.

**731. Interpersonal and Intergroup Dynamics—Added**

Intensive, experiential study of the dynamics of small groups through the use of the class itself as a laboratory study group. Students review readings in small group theory, role theory, and such group dynamics variables as communication patterns, norms, adaptation and coping mechanisms, role conflict and multi-group memberships. Prerequisite: Permission of the instructor. Mr. Jenks. 3 credits.

**758. Investments Analysis—Added**

An evaluation of capital markets and of analytical techniques useful for security appraisal. The following subjects will be covered: Securities characteristics; market institutions; yield structures; price change patterns; intrinsic value analysis; investment timing; and portfolio management. Lectures, outside readings, and security analysis research projects are the main tools of the course. Mr. Horrigan. Prerequisite: Business Administration 502 or permission of instructor. 3 credits.

**765. Advanced Financial Management—Added**

A study of financial policy of the firm with emphasis on solutions to complex problems of capital, leverage, optimal capital structure, capital budgeting, and working capital management. Prerequisite: Permission of the instructor. 3 credits. Mr. Wetzel.

**805. Management Information Systems—Deleted**

This course will be replaced by Business Administration 815-816.

**Decisions—Deleted**

This course will be replaced by Business Administration 815-816.

**813. Written Analysis of Business Problems—Added**

An intergration of basic disciplines through a program of written analysis of comprehensive business problems. No credit.

**815-816. Financial Reporting and Economic Analysis for Management—Added**

This course exposes the student to an integrated view of accounting and economic analysis. Its objectives are to provide the student with some general models of the firm for planning and reviewing operations and with a wide assortment of analytical techniques for decision making. 3 credits

**861. Control and Information Systems—Added**

The concepts of systems, their use in enterprise management, and the role and influence of on-line control systems; the nature and uses of information in management. The course includes materials intended to familiarize the student with information theory and technology. Mr. Beckett. 3 credits.

**895. Special Projects and Independent Study—Added**

Projects, research and reading programs in areas required for concentration. Approval of adviser and proposed instructor required. 3 credits. Staff.

**Chemistry (81)**

**699. Thesis—Modified**  
NLG. 5 credits.

**808. Introduction to Research Techniques—Modified**

Lectures and laboratory to show experimental methods and interpretation of results. Topics include Gas Liquid chromatography, data handling, nuclear



elementary electronics, and x-ray. Staff.  
1-3 credits.

## **Education (48)**

### **870. Laboratory in Counseling— Added**

Stimulation of the counseling relationship by involvement in role-playing procedures which will be electrically recorded (audio and video tape) for analysis and evaluation.

Prerequisite: Education 872. 3 credits.

### **888. Education in Foreign Countries— Deleted**

### **892. Sociology of Education: The Cultures of Poverty and Affluence— Added**

Spring Term. Bud B. Khleif. The two cultures are treated as a unit; culture change is discussed. Issues of current interest are explored, e.g., poverty, school desegregation, the school of geographically-mobile children, problems of social mobility and abundance, the rise of the counseling and healing trades, and teachers, quest for professionalism. The education of "culturally deprived" and "culturally endowed" children receives special attention. A comparative approach is adopted; issues are examined cross-culturally and in relation to the schooling process. 3 credits.

## **Electrical Engineering (83)**

### **501-502. Linear Systems I & II— Modified**

The fundamental physical laws, concepts, and analysis of electrical and mechanical systems. Dynamic response of such systems. Prerequisite: Mathematics 426 or 523 taken concurrently and Physics 404. 2 lectures; 2 recitations; 4 credits.

### **515-516. Sophomore Laboratory I and II—Added**

Introduction to electrical measuring instruments and techniques. Prerequisite:

concurrently. 1 laboratory; 1 credit.

### **519. Electrical Laboratory III— Added**

Extension of Electrical Engineering 511  
Prerequisite: Electrical Engineering 521 and 611 taken concurrently.  
1 recitation; 2 laboratories; 3 credits.

### **521. Energy Conversion and Control Components—Added**

A continuation of Electrical Engineering 520 and an introduction to control system. Prerequisite: Electrical Engineering 520. 3 recitations; 3 credits.

### **611. Electronic Circuits II— Modified**

Two-state circuits and devices. Switching Boolean Algebra and binary system logic. Analog-digital conversion. Information storage and retrieval. Prerequisite: Electrical Engineering 511  
3 recitations; 3 credits.

### **712. Logical Design of Digital Computers—Added**

Generalized, systematic approach to the logical design of digital computers and related digital systems encompassing circuit components, binary arithmetic, boolean algebra, simplification methods and derivation of application equations applicable to computer memory, input-output, arithmetic and control units. Within the developed framework the design of a general purpose computer will be formulated. Prerequisite: Electrical Engineering 611 or permission of instructor.  
4 credits;  
3 hours lecture; 1 laboratory.

### **741. Fundamentals of Acoustics— Modified**

Same course description. Change credit from 2 to 3 credits.

### **742. Fundamentals of Acoustics— Deleted**

Required

Introduction to information theory;  
Fourier Analysis; Continuous and  
Pulsed Modulation; sampling,  
quantization; noise in electrical circuits.  
3 recitations; 3 credits.

**758. Communication Systems—  
Added**

Applications of communication theory  
and electronics to high frequency  
communication system design.  
Modulators, R. F. Amplification,  
receivers, antennas, free space  
propagation, ionospheric properties.  
Prerequisite: Electrical Engineering 509,  
Electrical Engineering 757 or  
equivalent. 3 recitations; 1 laboratory;  
4 credits.

**796. Special Topics in Electrical  
Engineering—Added**

New or specialized courses are presented  
under this listing, on sufficient demand.  
Independent study can be given under  
this course title. Prerequisite:  
Permission of instructor. 1-4 credits.  
Laboratory projects are not given under  
this course number. See Electrical  
Engineering 695 or Electrical  
Engineering 898.

**801. Field Theory—Modified**

Change from 4 credits to 3 credits.

**802. Electromagnetic Wave  
Theory—Modified**

Change from 4 credits to 3 credits.

**803. Principles of Microwave  
Systems—Modified**

Change from 4 credits to 3 credits.

**804. Antennas—Modified**

Change from 4 credits to 3 credits.

**811. Fundamentals of Signal  
Processing—Modified**

Introductory probability theory, matrices  
and determinants, introductory graph  
theory. Laplace transforms and pole-zero

**812. Network Synthesis—Modified**  
Change from 4 credits to 3 credits.

**813. Nonlinear Networks—Modified**  
Change from 4 credits to 3 credits.

**814. Network Approximation—  
Modified**

Change from 4 credits to 3 credits.

**815. Linear Active Circuits—  
Modified**

Change from 4 credits to 3 credits.

**816. Nonlinear Active Circuits—  
Modified**

Change from 4 credits to 3 credits.

**817. Network Analysis—Added**  
Topological properties and analysis of  
networks; one to n-port networks;  
natural frequencies, eigen values, and  
state variables; parts of network  
functions; Fourier and Hilbert  
transforms; time-and-frequency domain  
correlation. Prerequisite: Electrical  
Engineering 811. 3 credits.

**831. Semiconductor Electronics—  
Modified**

Change from 4 credits to 3 credits.

**839. Statistical Theory of  
Communications—Modified**

Change from 4 credits to 3 credits.

**840. Information Theory—Modified**  
Change from 4 credits to 3 credits.

**851. Advanced Control Systems I—  
Modified**

Change from 4 credits to 3 credits.

**852. Advanced Control Systems II—  
Added**

Special topics in control theory; such as  
multivariate, optimal, adaptive, and  
other state-of-the-art control topics.  
Prerequisite: Electrical Engineering 851.  
3 credits.

Combinational circuits – including symmetric, threshold, and majority functions, bilateral networks, functional decomposition, equivalence classes, and non-binary logic. Cellular networks – including growth rates for various types of cellular arrays. Sequential networks – including analysis, transient behavior, state reduction methods, state assignment, and synthesis. Redundant circuits and other special topics. Mr. Pokoski.  
Prerequisite: Electrical Engineering 712.  
3 credits.

**891. Research—Modified**  
Change from 4 credits to 3 credits.

**892. Research—Modified**  
Change from 4 credits to 3 credits.

**898. Independent Study—Modified**  
Change from 1-4 credits per semester to 1-3 credits per semester.

**899. Electrical Engineering Thesis—Modified**  
Change from 8 credits to 6 credits.

## **English—Speech (49) (69)**

**303. English as a Second Language—Added**  
For students to whom English is a foreign language, a course of instruction in the speaking, reading, and writing of English. Messrs. van Ameyden van Duym and Frederick P. Murray, 3 recitations. No credits. Permission of instructors required for registration.

## **English (49)**

**517. Introduction to Literary Genres—Added**  
An introduction to literary forms, either traditional, such as “lyric”, “epic”, “comedy”, and “tragedy”, or modern, such as “novel”, “short story”, and “play”; the genres studied and their number vary from year to year.  
Prerequisites: English 401-402. 3 credits.

## **Analysis—Added**

An examination of literature apart from the historical context in a more advanced and detailed manner than possible in English 402. Works vary from year to year. Prerequisite: English 401-402. 3 credits.

## **520. Literature and the History of Ideas—Added**

An interdisciplinary study of literary works as influenced and illuminated by the concepts of philosophers, historians, and scientists. Prerequisite: English 401-402. 3 credits.

## **621. News Writing—Modified**

A laboratory course in the techniques of journalism. The student is taught to report and write under strict limitation of time and space. Mr. Murray.  
Prerequisite: English 401-402. 3 credits  
Written permission of instructor required for registration.

## **622. Independent Studies in Journalism—Modified**

Individual supervision in the skills acquired in English 621. Mr. Murray.  
Prerequisite: English 621. 3 credits.  
Written permission of instructor required for registration.

## **625-626. Writing Fiction and Poetry—Modified**

Change in numbering only, from 525-526 to 625-626.

## **651-652. Comparative World Literature—Added**

A comparison of two or more national literatures through movements, genres, motifs, and dominant philosophies and artistic ideas. 3 credits.

**697, 698. Senior Seminars—Added**  
Intensive study of specialized topics which vary from year to year.  
Enrollment in each seminar limited to fifteen students. 3 credits. Permission of instructor required. Exceptional junior

instructor and department chairman.

**706. English Linguistics—Added**  
A descriptive approach to modern English grammar, emphasizing the insights provided by linguistic analysis. 3 credits.

**711. Critical Analysis of Poetry and Drama—Modified**  
A non-historical, non-genre approach to individual poems and plays with emphasis on the works themselves. 3 credits.

**743. American Transcendentalists—Modified**  
Emerson, Thoreau and other transcendentalists. 3 credits (Formerly 775).

**747, 748. American Fiction and Drama of the Twentieth Century—Modified**  
Fitzgerald, Hemingway, O'Neill, Faulkner, and others. 3 credits. (Formerly 779, 780).

**760. Boswell's Johnson—Deleted**

**761. Wordsworth—Deleted**

**762. Browning—Deleted**

**769. The English Romantic Period—Modified**  
Wordsworth, Coleridge, Lamb, Hazlitt, DeQuincey, Byron, Shelley, Keats. 3 credits.

**795-796. Independent Study—Added**  
Individual guided study in special topics. Open to highly qualified juniors and seniors both semesters, but for a maximum of 3 credits. To be elected only with permission of the department chairman and of the supervising faculty member or members. Not open to graduate students. 1-3 credits.

**High School English Teachers—Added**  
A course designed to improve the teacher's skill in composition and to guide in methods of transmitting such skill to his high school students. 3 credits.

**802. Advanced Literary Analysis for High School English Teachers—Added**  
A course designed to improve the teacher's skill in critical and imaginative reading and to guide him in methods of developing this skill in his students. 3 credits.

**891. Seminar – Studies in American Literature of the 19th Century—Added**  
Mr. Nicoloff. 3 credits. One weekly three-hour meeting. Open only to graduate students. Intensive study of selected topics which change from year to year.

**Forest Resources (30)**  
**635. Conservation of Forest Resources**  
Change of course number from 401.

**712. Sampling Techniques—Added**  
A study of the techniques of sampling a finite population. Topics include choice of sampling unit and frame, estimation of sample size, confidence limits, and comparisons of sample designs. Mr. Barrett. Prerequisite: Forest Resources 528 or equivalent. 3 credits.

**755. Forest Wildlife Management—Modified**  
Readings and discussions on the properties of wildlife species and the various phases of management including habitats, harvest, public relations, law enforcement and control of undesirable species. Students should be prepared to participate in week-end field trips to game management areas in New England. Mr. Olson. Prerequisite: Forest Resources 734 or permission of instructor. 2 lectures; 1 laboratory; 4 credits.



### **783. Historical Geography of the**

**U.S.—Added**

A geographic analysis of population, economy and resources at several stages in the development of the United States to 1900. Study of places as they were in the past and as they were perceived.

Mr. LeBlanc. 3 credits.

### **Geology (51)**

#### **725. Igneous and Metamorphic**

**Petrography—Added**

The study of igneous and metamorphic rocks in thin section; the optical identification of minerals and the significance of texture; the application of experimental petrology to

petrogenesis. Mr. Bothner. Prerequisite:

Geology 613, 622 or permission of the instructor; 2 lectures; 1 laboratory;

3 credits.

### **French (56)**

#### **791. Problems of Teaching French—Added**

Teaching methods, materials, devices, and an introduction to linguistics as applied specifically to the problems of teaching French. Examination of the goals and organization of French programs in American schools.

Observation of classes in the local school system. For prospective teachers of French at pre-college levels. 3 credits.

No credits toward a major. Prerequisites: French 605-606 and French 514 or its equivalent; Education 758 with grade of C or better.

### **German (57)**

#### **691-692. Intermediate Composition and Conversation—Added**

A systematic study of grammar and syntax. Composition of increased difficulty. Oral training with goals toward greater fluency and accuracy of expression. Course will be conducted exclusively in German. Prerequisite: German 501-2, 507-8. 3 credits. (Required for German majors not taking 685-6.)

**Added**

An extensive study of the German Novella throughout the ages, with an interpretation of the most representative works by distinguished authors of this special literary genre. Course will be conducted exclusively in German.

Prerequisite: German 501-2, 507-8.

3 credits (Required for German majors not taking 685-6).

#### **795/895 and 796/896. Special**

**Studies in German Literature—**

**Modified**

Add the following topics: (10) Drama of the German Classics. Lessing. (11)

Drama of the German Classics: Goethe.

(12) Drama of the German Classics:

Schiller. (13) Gothic (14) Old High

German.

### **History (53)**

#### **697, (697). Colloquia for Senior**

**History Majors—Added**

Intensive study of selected historical subjects in seminar or colloquium. Topics and instructors to be announced each year. Open only to History majors. This course is required of all History majors and is expected that they will take this course during their senior year.

Juniors may be admitted with permission of the instructor. May not be repeated for credit. Offered both semesters annually. Staff. 3 credits.

#### **703. The Colonial Period of American History—Added**

Anglo-America from the late sixteenth century to the mid-eighteenth century, encompassing a general and interpretive view of the development of an Anglo-American culture along the eastern seaboard of North America. Mr. Rutman. 3 credits.

#### **704. The Sources and Methods of Colonial American History—Added**

An introduction to the materials and methodology of the historian of

series of problems underlying the interpretations considered in 703, specific approaches to these materials, and what historians have done with the materials. Prerequisite: History 703 and (for graduate students) permission of the instructor. Mr. Rutman. 3 credits.

**705, 706. America in the Eighteenth Century and the Revolution—Added**  
American Colonial and Revolutionary History during the period from 1740 through the adoption of the Constitution and the establishment of Washington's first administration. Mr. Gilmore. 3 credits.

**707, 708. Colonial and Revolutionary American History—Deleted**

**799. Colloquia in History—Deleted**

**803. Readings in the Colonial Period of American History—Added**  
Extensive and directed readings in the history of Anglo-America from the late sixteenth century to mid-eighteenth century, encompassing the historiography of the period but stressing the scholarship of the last two decades. Prerequisite: Permission of the instructor. Mr. Rutman. 3 credits.

**804. Seminar in the Colonial Period of American History—Added**  
Directed research and writing in the history of Anglo-America from the late sixteenth to mid-eighteenth century. Prerequisite: Permission of the instructor. Mr. Rutman. 3 credits.

**805-806. Seminar in the American Revolutionary Period—Added**  
Graduate seminar in American Colonial and Revolutionary History from 1740 through the establishment of Washington's first administration. Mr. Gilmore. 3 credits.

**807, 808. Sources for the Study of American History—Deleted**

## **418. Basic Experimental Laboratory—Added**

A basic laboratory experience in the composition and formation of foods as directly related to food service problems encountered within the Hotel and Restaurant field. Laboratory work to be in conjunction with Home Economics 418. For Hotel Majors or by permission of the instructor. 1 credit. Hours to be arranged.

## **Humanities (43)**

### **501-502. Humanities—Modified**

A course in general education involving the departments of English, French and Italian, German and Russian, Spanish and Classics, Speech and Drama, Philosophy, The Arts, and Music. It aims to develop an appreciation of literature, the various arts, and philosophy, and to give an understanding of western cultural traditions. The course will operate within an historical framework but is not intended to be an historical survey. One lecture and three recitations a week. In addition to the readings and slides, there will be visits to museums when trips can conveniently be arranged. Mr. Casas, Mr. Daggett, Mr. Leighton, Mr. Maynard, and guest lecturers. Not open to freshmen. 4 credits.

## **Languages (55)**

### **601-602. Elementary Sanskrit—Added**

Elements of grammar, reading of simple selections. The language is approached from the standpoint of its value as the oldest language extant in the Indo-European family. Basic elements of comparative Indo-European linguistics included. Prerequisite: Some language training or permission of instructor. 3 credits.



#### **402. Digital Computation**

##### **Principles II—Modified**

Digital computer applications with an introduction to the FORTRAN IV language and the use of the IBM OS/360 and Remote Access Computing System. Prerequisite: Mathematics 401. 1 lecture; 1 credit. NOTE: This course will be offered Semester I, 1968-69 only.

#### **410. Introduction to Digital Computer Systems—Added**

An introduction to electronic digital computers and digital computer applications with emphasis on programming using the FORTRAN II and FORTRAN IV compiler languages. Other topics will include the use of the graphic plotter, use of the Remote Access Computing System, advanced programming techniques, and a brief introduction to the purpose and function of the operating system. No previous knowledge of computers or college mathematics is assumed. Designed for non-business students. 2 lectures; 1 laboratory; 3 credits.

#### **411. Introduction to Computer Systems with Business Applications—Modified**

An introduction to the basic concepts of electronic digital computers and data processing with emphasis on business applications. The first half of the course is concerned with elementary programming techniques, flowcharting and FORTRAN II programming on the IBM 1620. The second half offers a brief survey of COBOL, an introduction to the IBM OS/360 and data processing procedures. Designed for business students with no previous knowledge of computers or college mathematics assumed. Not open to freshmen without instructor's permission. 2 lectures; 1 laboratory; 3 credits.

#### **Systems—Added**

A systems programming course designed to introduce assemblers, loaders and compilers. Students will learn to program the basic language of the IBM OS/360. Other topics to be studied: time sharing and remote access; tape, disk and graphic plotter input/output; and PLI language. Prerequisite, Math 410 or 411 or equivalent. No credit given to students who have passed Mathematics 410 or 411 or equivalent. No credit given to students who have passed Mathematics 754. 2 lectures; 2 credits.

#### **841-842. Algebraic Topology—Added**

Chain complexes; homology of simplicial complexes; singular homology and cohomology; axiomatic homology; cup and cap products; topological manifolds; sheaves. 3 credits.

#### **848. Geometry—Deleted**

This course has never been given.

#### **Mechanical Engineering (85)**

##### **663. Materials II—Deleted**

#### **726. Experimental Mechanics—Modified**

No change in catalog description except increasing credits from 3 to 4.

#### **727. Advanced Mechanics of Solids—Modified**

No change except in catalog description except increasing credits from 3 to 4.

#### **728. Advanced Dynamics—Modified**

No change in catalog description except for increasing credits from 3 to 4.

#### **740. Discontinuous Control—Added**

The analysis and synthesis of feedback control systems operating on quantized information; compensation and performance improvement methods which use the quantized nature of the information are also developed. 3 credits

Continued  
No change in catalog description except increasing credits from 3 to 4.

**91. Special Topics in Mechanics—Added**

Contents of course may vary from year to year. 4 credits.

**101. Continuum Mechanics—Modified**

No change in catalog description except increasing credits from 3 to 4.

**103. Advanced Heat Transfer—Modified**

Heat conduction equation; temperature fields and the heat flux vector; analytical solution of the conduction equation in several variables; initial and boundary value problems; numerical methods of solution. 3 credits.

**104. Radiation Heat Transfer—Added**

The fundamentals of radiant heat transfer. Development and solution of the wave equation for electromagnetic radiation. Analysis of Planck's law of radiation and earlier theories. Methods of solution of radiant interchange in real systems with and without absorbing media. 3 credits.

**105. Convection Heat Transfer—Added**

An analytical study of heat transfer to laminar and turbulent boundary layers of compressible and incompressible fluids. Basic differential equations governing the heat transfer are derived and analytical solutions are obtained where possible and checked with experimental results. 3 credits.

**112. Vibration of Continuous Media—Modified**

No change in catalog description except increasing credits from 3 to 4.

**126. Theory of Elasticity—Modified**

No change in catalog description except increasing credits from 3 to 4.

No change in catalog description except increasing credits from 3 to 4.

**829. Theory of Plates and Shells—Modified**

No change in catalog description except increasing credits from 3 to 4.

**891. Topics in Mechanics—Modified**

No change in catalog description except increasing credits from 3 to 4.

**Microbiology (47)**

**708. Marine Microbiology**

Change of course number from 707 to 708.

**Music (63)**

**695. Music Honors Program—Added**

An Honors Program involving two types of work: 1) The student pursues independent study in one or more specialized areas. 2) The student attends a seminar concerned with an area in which no appropriate course is offered in the undergraduate curriculum. The student will be given an opportunity in the seminars to discuss his own research with members of the faculty and other participating students.

Prerequisite: A student must have an average of 3.0 or must show exceptional aptitude for music. Mr. Polk. Mr. Wicks. Arranged. 3-6 credits.

**711. The Lied—Added**

Study of the history and literature of the German art-song, with special emphasis on the 19th and early 20th century. Prerequisite: Permission of the instructor. 2 credits.

**712. The Art Song—Added**

Study of the history and literature of non-German Art Song. Prerequisite: Permission of the instructor. 2 credits.

**727-728. Form and Analysis—Added**

A consideration of various formal and textural elements both as concepts and

Philosophy 400).

## **520. Introduction to Oriental Philosophy—Modified**

A philosophical introduction to the systems of ideas in the Orient (Hinduism, Buddhism, Confucianism, Taoism, etc.). 4 credits. (Formerly Philosophy 420).

## **Physical Education for Women (91)**

### **426. Physical Education Courses (Specialized)—Added**

No special description. Course number to be added to sequence of numbers in University Catalog for specialized courses for junior women physical education majors.

### **425. Dance Composition—Added**

A developmental study and exploration of the choreographic process. Miss Morrison. 1 or 2 credits. Prerequisite: Beginning and Intermediate Modern Dance.

## **Plant Science (32)**

### **832. Developmental Genetics—Added**

Relation of protein, RNA, and DNA synthesis to development, chromosome differentiation, nuclear-cytoplasmic interactions, genic and non-genic control of subcellular organization, cellular continuity, cell associations, experimental embryology, hormones and post-embryonic development, gene regulation in development, and neoplastic growth. Mr. Loy. Prerequisite: Consent of Instructor. 3 lectures; 3 credits. (Spring, alternate years offered in 1968-1969).

## **Political Science (52)**

### **535. Theory of International Relations—Modified**

The theory of international relations and the development of the nation-state system with some attention paid to

Thorough analysis of smaller and larger masterworks from the standpoint of harmony, counterpoint, structural line and formal articulation.

Prerequisite: Music 523-524. 2 credits.

## **729-730. Advanced Composition—Added**

This course will cover material ranging from strict composition in the "traditional forms" to free composition in "contemporary forms". Exactly what is stressed will depend, in large part, on the makeup of the particular class. Work will be done on both an individual and group basis. 2 credits.

## **Philosophy (66)**

### **405. Lectures in Philosophy—Added**

A series of fifteen lectures, one lecture a week, presented to the University.

The lectures will present philosophical aspects of current issues. The issues chosen will be those which have wide and urgent impact on society and which are of interest to the entire university community. Freshman and Sophomore students may elect to take this course as an introductory course in philosophy.

Students who elect the course will attend all of the lectures as well as two small discussion sections a week. There will be a list of readings required for those enrolling in the course.

Quizzes and short papers will be required in the discussion sections. There will be an examination for all credit students and credit will be given on a NLG basis. 3 credits.

### **412. Introduction to Logic—Modified**

An introduction to the principles of good reasoning, including practice in their application. The correct use of language, the logical structure of arguments, the detection of fallacies in reasoning, and the nature of scientific method. Mathematics and technology major students are advised to take Philosophy 550, Symbolic Logic. Open to

study of the behavior of nation-states in relation to one another. A laboratory in game theory and simulation. Prerequisite: Political Science 405 or permission of the instructor. Mr. Larson. 3 lectures; 1 laboratory; 4 credits.

### **536. Practice of International Relations—Modified**

The practice of international relations and the struggle for power, prestige and prosperity between and among nation-states with some analysis of the national interest – ideological axis. A laboratory in game theory and simulation. Prerequisite: Political Science 535 or permission of instructor. Mr. Larson. 3 lectures; 1 laboratory; 4 credits.

### **95. Delete**

### **32. Comparative Administration—Added**

An examination of the structure, conceptual foundations, and dynamics of administrative systems in major countries. Prerequisite: Political Science 31, (831) or permission of instructor. Mr. Savage. 3 credits. (To be offered as a senior-graduate level seminar meeting once or twice a week).

### **33. "American National, State and Local Administration—Deleted**

### **71. Research in Political Behavior—Added**

An introduction to the methodology and techniques of research in political behavior, broadly defined. Emphasis will change from time to time to include various types of empirical research and their optimal use. Such approaches as surveys, experimental design, and basic data processing techniques will be combined with library and documentary research to produce a significant research paper by each student. Mr. Craig. 3 credits.

**501. General Psychology—Modified**  
An introduction to psychology as a behavioral science, with emphasis on both its theoretical and applied aspects. The course is a prerequisite for all other courses in the Department, except with permission of the instructor. Cannot be counted for major credit. Offered both semesters. Staff. 3 (4) credits.

### **502. Advanced General Psychology—Modified**

A thorough investigation of general psychology intended to give the student a strong basis for all other work in psychology. An in depth examination of some of the topics discussed in Psychology 401. This course is required of all majors and minors in psychology and is the prerequisite for all course work except 537, 545, 567 and 663. Staff. 3 (4) credits.

### **795, 796. Independent Study—Added**

This course provides the opportunity for a psychology major to pursue independent study with a member of the faculty. Arrangements are to be made with the individual faculty members and enrollment is by permission only. 1-3 credits (4) per semester. May be repeated.

### **Resource Economics (21)**

#### **705. Structure, Economic Problems and Planning of Communities in the Non-Urban Environment—Added**

The community is taken as an economic unit and analyzed using appropriate methodologies with emphasis on economic growth. Economic forces relative to employment, income, transportation, housing, etc., are analyzed. Community income, expenditures and public services are taken in the context of growth and planning. Mr. Le Ray. Prerequisites: 1 course in Social Science. 4 credits.



### **Economic Activities—Added**

Economic theories explaining the behavior of individual firms and consumers in selecting sites for carrying on economic activities.

The relationship of these theories to patterns of industrial location, systems of cities, and land use competition in general. Problems of locational change and adjustment and the effects of public policy on spatial economic activities. Mr. Ching. Prerequisite: Resource Economics 402 or Economics 402, or permission of the instructor. 4 credits.

### **Russian (61)**

601. Delete

### **Sociology (68)**

801. Intermediate Social Statistics—Added

Application of descriptive and inductive statistical methods to the analysis of sociological data including sampling distributions, statistical decision making, analysis of variance, correlation and regression, and nonparametric measures. Prerequisite: Sociology 701 or permission. 4 credits.

802. Research Design—Added

Systematic investigation of each step involved in the design of sociological research. The formulation of conceptualization of research problems will be discussed. Selected techniques of data collection, processing, and analyses will be examined. Prerequisite: Sociology 701 and 702 or their equivalent and/or consent of the instructor. 4 credits. For graduate students.

803. Special Problems in Methods and Statistics—Added

Attention is focused on one or more special problems in sociological research such as the following: Measurement and scaling; field and laboratory experiments in sociology; multivariate analysis; historical methods; community

sociological research; survey design and analysis. Prerequisite: Intermediate Social Statistics (801) and Research Design (802) or equivalent. 4 credits.

811. Sociological Theory I—Added

A critical examination of the content, presuppositions, and implications of the body of sociological theory, exemplifying the full range of sociological inquiry. This course is required for both M.A. and Ph.D. candidates. Prerequisite: Sociology 711 and 712 or the equivalent. 4 credits.

812. Sociological Theory II—Added

A critical examination of the content, presuppositions, and implications of contemporary sociological theory. The student will engage in theory construction and analysis, and will be encouraged to relate his particular interests in substantive areas to these undertakings. This course is required for both M.A. and Ph.D. candidates. Prerequisite: Sociology 811. 4 credits.

815. Criminology Internship—Deleted

### **Soil and Water Science (23)**

804. Hydrochemistry—Added

Concerned mainly with fresh waters at or near the surface of the earth. The waters are treated from a chemical viewpoint as analogous to low pressure, low temperature, dilute aqueous solutions. Major topics include buffering mechanisms, oxidation-reduction reactions, ion exchange, and chemical systems involving silicate and carbonate minerals. Particular emphasis given to methods of interpretation. Mr. Hall. Prerequisite: Chemistry 683-684 or equivalent. 2 lectures; 1 laboratory; 3 credits.





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